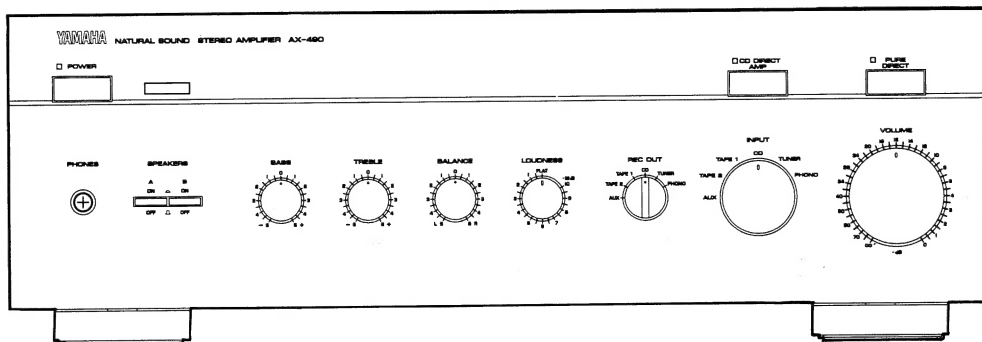
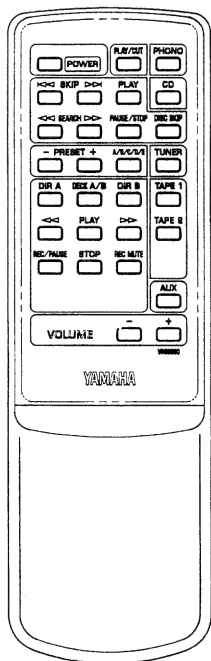


# STEREO INTEGRATED AMPLIFIER

# AX-490

## SERVICE MANUAL



AX-490

### IMPORTANT NOTICE

This manual has been provided for the use of authorized YAMAHA Retailers and their service personnel. It has been assumed that basic service procedures inherent to the industry, and more specifically YAMAHA Products, are already known and understood by the users, and have therefore not been restated.

**WARNING:** Failure to follow appropriate service and safety procedures when servicing this product may result in personal injury, destruction of expensive components, and failure of the product to perform as specified. For these reasons, we advise all YAMAHA product owners that any service required should be performed by an authorized YAMAHA Retailer or the appointed service representative.

**IMPORTANT:** The presentation or sale of this manual to any individual or firm does not constitute authorization, certification or recognition of any applicable technical capabilities, or establish a principle-agent relationship of any form.

The data provided is believed to be accurate and applicable to the unit(s) indicated on the cover. The research, engineering, and service departments of YAMAHA are continually striving to improve YAMAHA products. Modifications are, therefore, inevitable and specifications are subject to change without notice or obligation to retrofit. Should any discrepancy appear to exist, please contact the distributor's Service Division.

**WARNING:** Static discharges can destroy expensive components. Discharge any static electricity your body may have accumulated by grounding yourself to the ground buss in the unit (heavy gauge black wires connect to this buss).

**IMPORTANT:** Turn the unit OFF during disassembly and part replacement. Recheck all work before you apply power to the unit.

### ■ CONTENTS

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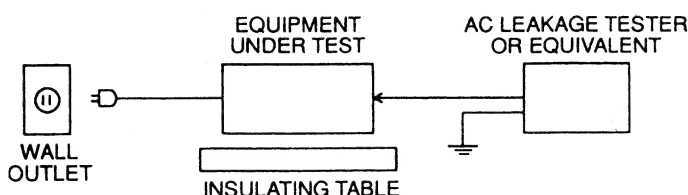
100515

**YAMAHA**  
YAMAHA CORPORATION  
P.O.Box1, Hamamatsu, Japan

3.3K-791 Printed in Japan '95.5

## ■ TO SERVICE PERSONNEL

1. Critical Components Information.  
Components having special characteristics are marked  $\Delta$  and must be replaced with parts having specifications equal to those originally installed.
2. Leakage Current Measurement (For 120 V Model Only).  
When service has been completed. It is imperative that you verify that all exposed conductive surfaces are properly insulated from supply circuits.
  - Meter impedance should be equivalent to 1500 ohms shunted by 0.15  $\mu$ F.
  - Leakage current must not exceed 0.5 mA.
  - Be sure to test for leakage with the AC plug in both polarities.



## ■ WARNING: CHEMICAL CONTENT NOTICE!

The solder used in the production of this product contains LEAD. In addition, other electrical/electronic and/or plastic (where applicable) components may also contain traces of chemicals found by the California Health and Welfare Agency (and possibly other entities) to cause cancer and/or birth defects or other reproductive harm.

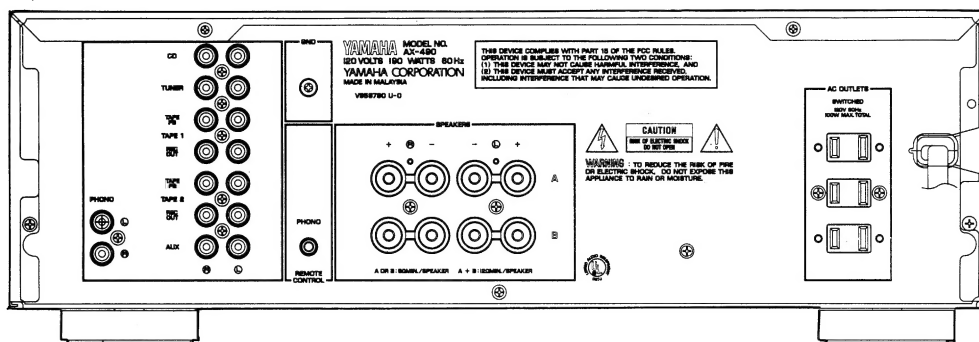
**DO NOT PLACE SOLDER. ELECTRICAL/ELECTRONIC OR PLASTIC COMPONENTS IN YOUR MOUTH FOR ANY REASON WHAT SO EVER!**

Avoid prolonged, unprotected contact between solder and your skin! When soldering, do not inhale solder fumes or expose eyes to solder/flux vapor!

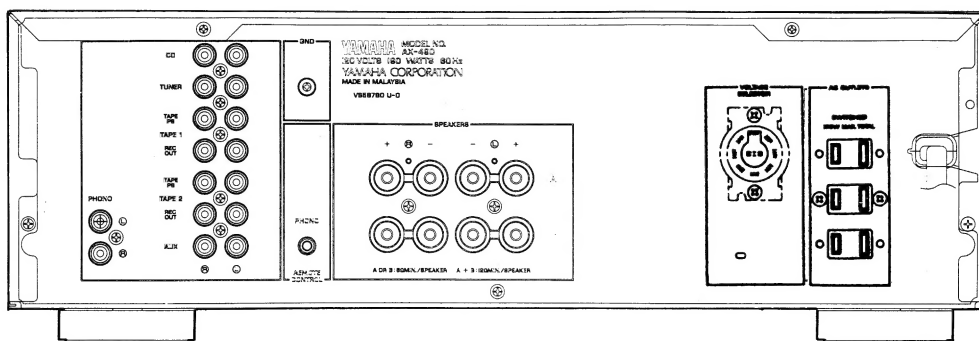
If you come in contact with solder or components located inside the enclosure of this product, wash your hands before handling food.

## ■ REAR PANELS

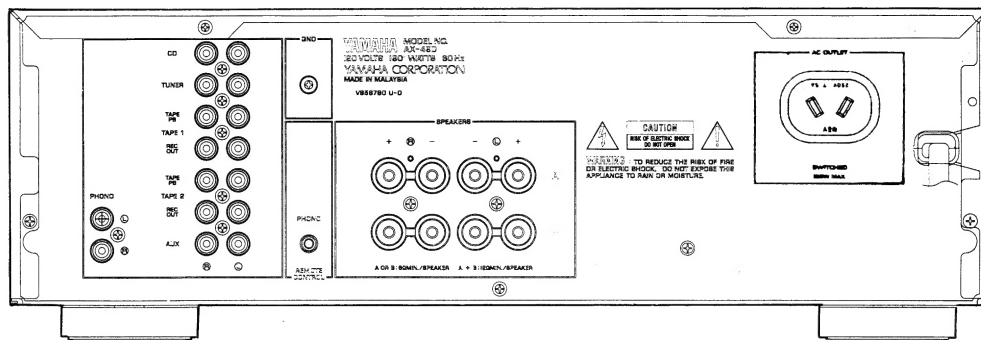
### ● U, C models



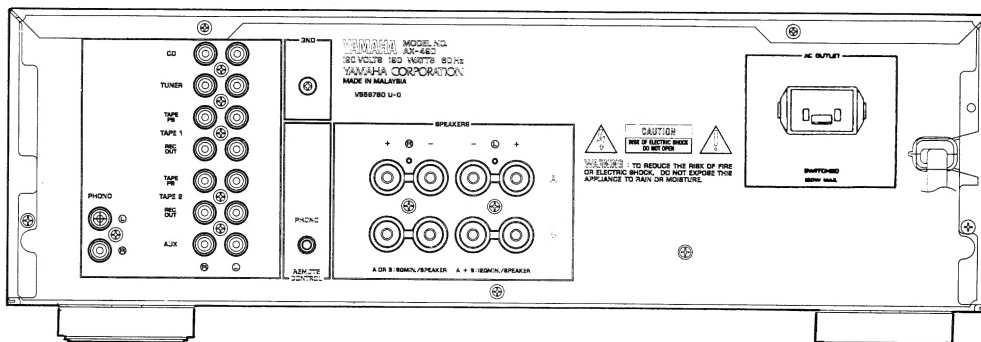
### ● R model



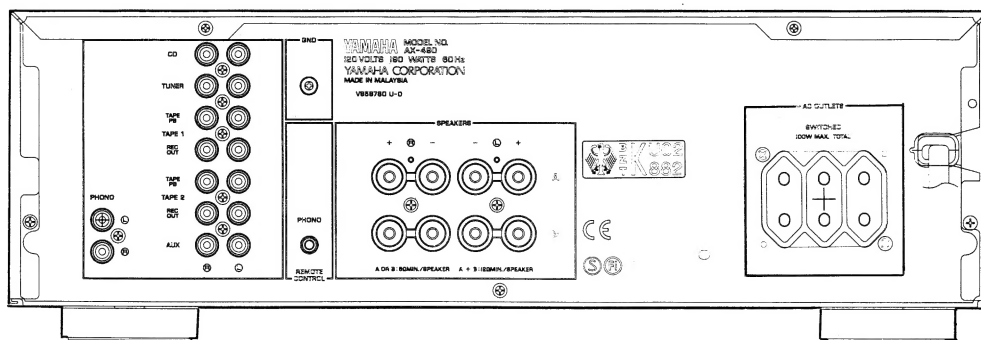
● A model



● B model



● G model



# **SPECIFICATIONS**

## **AUDIO SECTION**

### **Minimum RMS Output Power per Channel**

|                               |      |
|-------------------------------|------|
| 8Ω, 20Hz to 20kHz, 0.019% THD | 85W  |
| 6Ω, 20Hz to 20kHz, 0.038% THD | 100W |

### **Dynamic Power per Channel (IHF)**

|          |                  |
|----------|------------------|
| 8/6/4/2Ω | 130/150/185/220W |
|----------|------------------|

### **DIN Standard Output Power per Channel (G model)**

|                    |      |
|--------------------|------|
| 1kHz, 0.7% THD, 4Ω | 120W |
|--------------------|------|

### **IEC Power (G model)**

|                      |      |
|----------------------|------|
| 1kHz, 0.019% THD, 8Ω | 100W |
|----------------------|------|

### **Power Band Width**

|                       |               |
|-----------------------|---------------|
| 8Ω, 42.5W, 0.038% THD | 10Hz to 50kHz |
|-----------------------|---------------|

### **Damping Factor (U, C, A, B, G models)**

|                   |             |
|-------------------|-------------|
| 8Ω, 20Hz to 20kHz | 240 or more |
|-------------------|-------------|

### **Damping Factor (DIN)**

|                     |             |
|---------------------|-------------|
| 8Ω, 40Hz to 12.5kHz | 120 or more |
|---------------------|-------------|

### **EIAJ Maximum Power (R model)**

|                   |      |
|-------------------|------|
| 1kHz, 10% THD, 8Ω | 130W |
| 1kHz, 10% THD, 6Ω | 150W |

### **Input Sensitivity/Impedance**

|          |            |
|----------|------------|
| PHONO MM | 2.5mV/47kΩ |
| CD etc.  | 150mV/47kΩ |

### **Maximum Input Signal Level (1kHz, 0.003% THD)**

|          |       |
|----------|-------|
| PHONO MM | 115mV |
|----------|-------|

### **Output Level/Impedance**

|         |            |
|---------|------------|
| REC OUT | 150mV/470Ω |
|---------|------------|

### **Headphone Jack Rated Output/Impedance**

|                     |           |
|---------------------|-----------|
| 0.019% THD, RL = 8Ω | 0.3V/680Ω |
|---------------------|-----------|

### **Frequency Response (20Hz to 20kHz)**

|         |         |
|---------|---------|
| CD etc. | 0±0.5dB |
|---------|---------|

### **RIAA Equalization Deviation (20Hz to 20kHz)**

|          |         |
|----------|---------|
| PHONO MM | 0±0.3dB |
|----------|---------|

### **Total Harmonic Distortion (20Hz to 20kHz)**

|                              |        |
|------------------------------|--------|
| PHONO MM to REC OUT (3V)     | 0.003% |
| CD etc. to SP OUT (42.5W/8Ω) | 0.008% |

### **Intermodulation Distortion (8Ω)**

|         |       |
|---------|-------|
| CD etc. | 0.01% |
|---------|-------|

### **Signal-to-Noise Ratio (IHF-A Network)**

|                               |       |
|-------------------------------|-------|
| PHONO MM (5mV Input Shorted)  | 88dB  |
| CD DIRECT AMP SW ON (Shorted) | 110dB |

### **Residual Noise (IHF-A Network)**

|                     |      |
|---------------------|------|
| CD DIRECT AMP SW ON | 35μV |
| PURE DIRECT SW ON   | 90μV |

### **Channel Separation**

|   |           |
|---|-----------|
| CD etc. (Input 5.1kΩ Terminated) 1kHz/10kHz | 65dB/50dB |
|---|-----------|

### **Tone Control Characteristics**

|                    |               |
|--------------------|---------------|
| BASS : Boost/cut   | ±10dB (20Hz)  |
| Turnover Frequency | 350Hz         |
| TREBLE : Boost/cut | ±10dB (20kHz) |
| Turnover Frequency | 3.5kHz        |

### **Continuous Loudness Control**

|  |             |
|--|-------------|
|  | -30dB(1kHz) |
|--|-------------|

### **Gain Tracking Error (0dB to -60dB)**

|  |     |
|--|-----|
|  | 2dB |
|--|-----|

### **Remote Control Custom Code**

|  |    |
|--|----|
|  | 7A |
|--|----|

## **GENERAL**

### **Power Supply**

|             |                              |
|-------------|------------------------------|
| U, C models | AC 120V, 60Hz                |
| A, B models | AC 240V, 50Hz                |
| G model     | AC 230V, 50Hz                |
| R model     | AC 110/120/220/240V, 60/50Hz |

### **Power Consumption**

|                   |      |
|-------------------|------|
| U model           | 190W |
| C model           | 250W |
| A, B, G, R models | 210W |

### **AC Outlets**

|                   |                   |
|-------------------|-------------------|
| Switched x 3      |                   |
| U, C, G, R models | 100W max. (Total) |
| Switched x 1      |                   |
| A, B models       | 100W max.         |

### **Dimensions (W x H x D)**

|  |                   |
|--|-------------------|
|  | 435 x 146 x 386mm |
|--|-------------------|

|  |                               |
|--|-------------------------------|
|  | (17-1/8" x 5-3/4" x 15-1/16") |
|--|-------------------------------|

### **Weight**

|  |                     |
|--|---------------------|
|  | 9.2kg (20 lbs 4 oz) |
|--|---------------------|

### **Accessories**

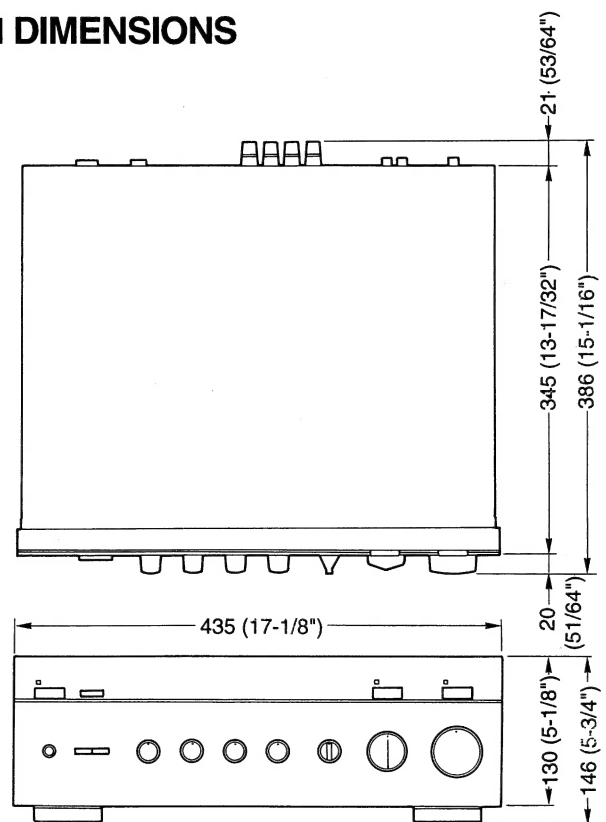
|  |                                |
|--|--------------------------------|
|  | Remote Control Transmitter x 1 |
|--|--------------------------------|

|  |                              |
|--|------------------------------|
|  | Battery (size "AA", R06) x 2 |
|--|------------------------------|

\* Specifications subject to change without notice.

|                |                         |                |                       |
|----------------|-------------------------|----------------|-----------------------|
| <b>U</b> ..... | <b>U.S.A. model</b>     | <b>C</b> ..... | <b>Canadian model</b> |
| <b>A</b> ..... | <b>Australian model</b> | <b>B</b> ..... | <b>British model</b>  |
| <b>G</b> ..... | <b>German model</b>     | <b>R</b> ..... | <b>General model</b>  |

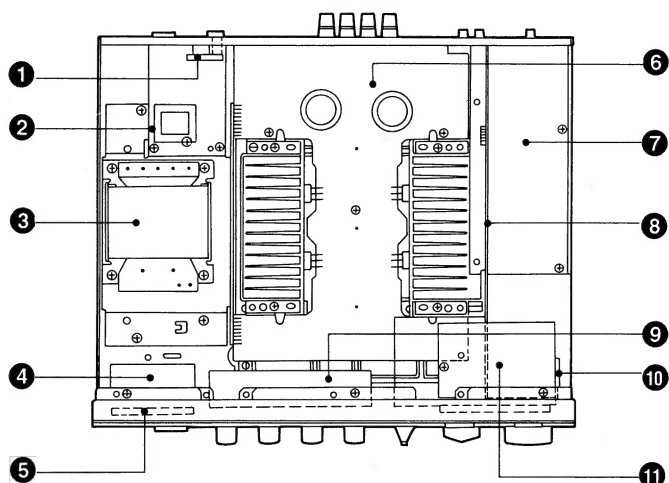
## **DIMENSIONS**



unit: mm (inch)



## INTERNAL VIEW



- ① MAIN CIRCUIT BOARD (6), (R model)
- ② MAIN CIRCUIT BOARD (2)
- ③ POWER TRANSFORMER
- ④ FUNCTION CIRCUIT BOARD (7)
- ⑤ FUNCTION CIRCUIT BOARD (8)
- ⑥ MAIN CIRCUIT BOARD (1)
- ⑦ FUNCTION CIRCUIT BOARD (5)
- ⑧ FUNCTION CIRCUIT BOARD (1)
- ⑨ FUNCTION CIRCUIT BOARD (4)
- ⑩ FUNCTION CIRCUIT BOARD (6)
- ⑪ FUNCTION CIRCUIT BOARD (3)

## DISASSEMBLY PROCEDURES

(Remove parts in disassembly order as numbered)

### 1. Removal of Top Cover

Remove 8 screws (① to ③) in Fig. 1, and slide the Top Cover back.

### 2. Removal of Front Panel

Remove 6 screws (④ and ⑤) in Fig. 2, and pull the Front Panel forward.

### 3. Removal of Rear Panel

Remove 12 screws (⑥) in Fig. 3.

#### Precautions for Replacement of Input Selector Switch

Make sure to perform initial setting of the input selector switch after its replacement.

#### • How to perform initial setting

Position the selector switch at the mid-point between the CD position and TUNER position and turn ON the POWER switch. Then the SELECTOR switch turns automatically till it stops at the "CD" position finally.

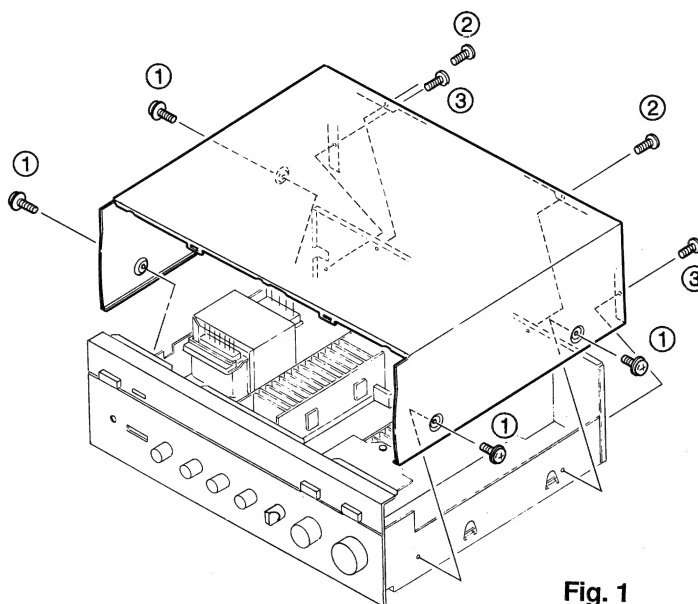


Fig. 1

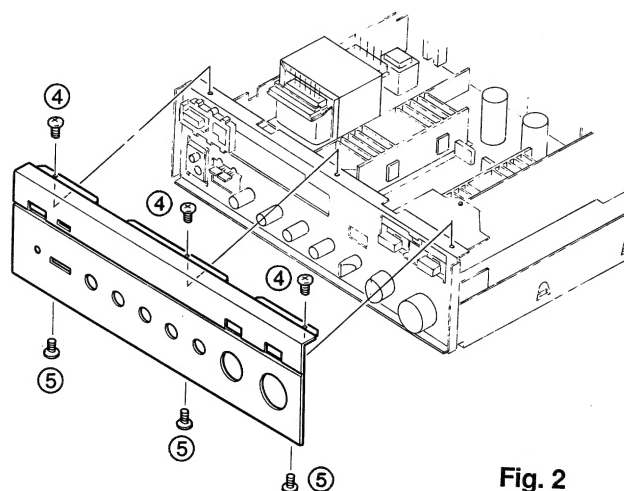


Fig. 2

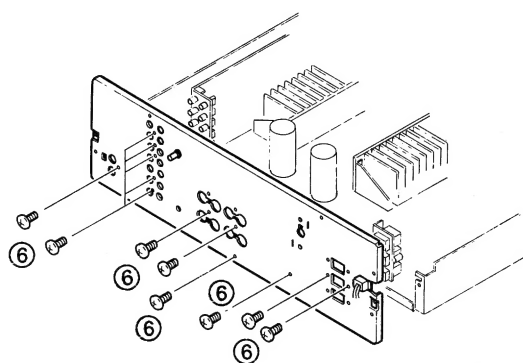


Fig. 3

## ■ ADJUSTMENTS

### 1. Before Adjustment

- Make sure that AC line voltage is within:

| Models | AC line voltage              |
|--------|------------------------------|
| U, C   | 120 V $\pm$ 10%              |
| G      | 230 V $\pm$ 10%              |
| A, B   | 240 V $\pm$ 10%              |
| R      | 110/120/220/240 V $\pm$ 10 % |

### 2. Instruments required

- AC VM or dual channel AC VM
- DC VM

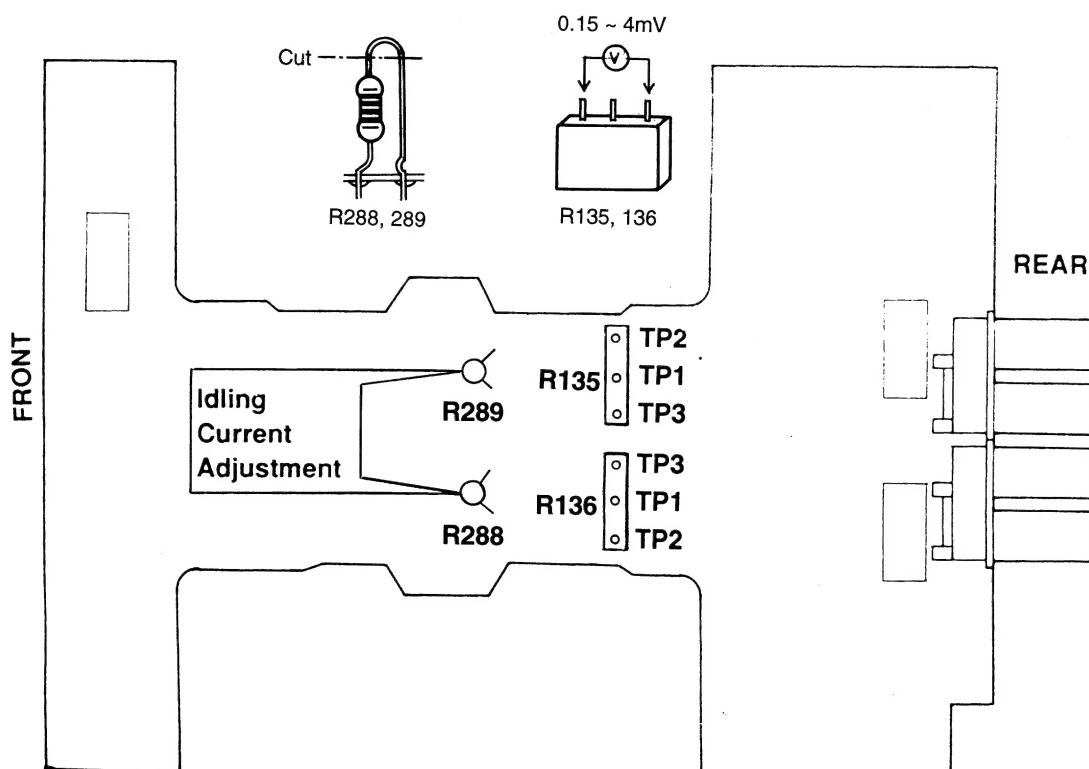
### ● IDLING CURRENT ADJUSTMENT

- After replacing the power and drive transistors, confirm idling current.
- After the power has been turned on, confirm that the voltage across R135 (Lch), R136 (Rch) is between 0.15 mV to 4 mV.  
If it exceeds 4.1 mV, open (cut off) R135 (Lch) or R136 (Rch) and reconfirm it.
- If R289 (Lch) or R288 (Rch) have been already cut and the idling current does not flow, re-solder the resistor (1k $\Omega$ ) at R289 (Lch) or R288 (Rch).
- Q117 and Q118 are transistors for temperature correction. Apply silicone grease to the contact surface with the heat sink.

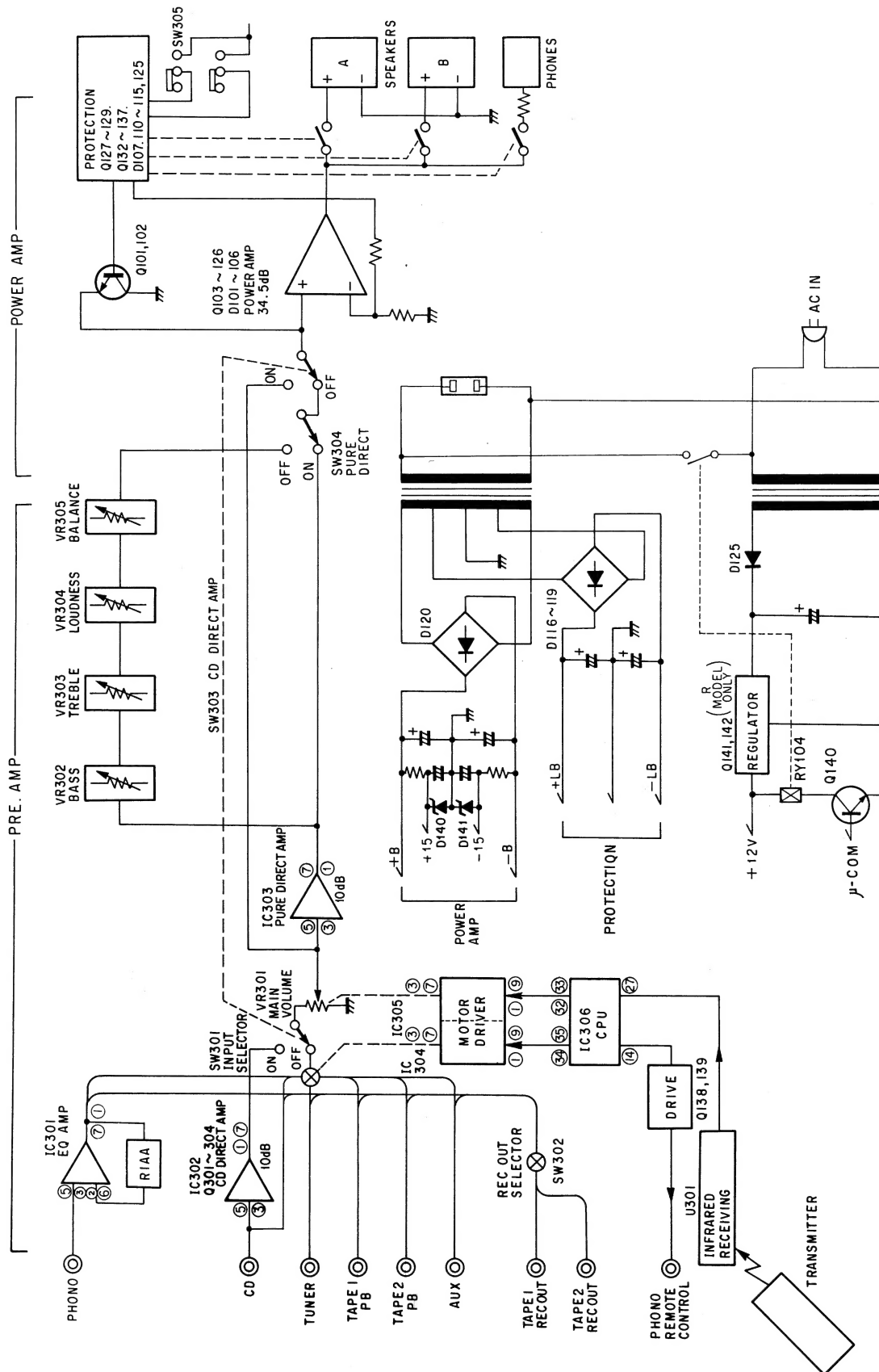
|     | Test points   | Adjustment point | Rating     |
|-----|---|------------------|------------|
| Lch | Across the terminals of R135 (TP1 and 2 or 1 and 3) | R289             | 0.15 ~ 4mV |
| Rch | Across the terminals of R136 (TP1 and 2 or 1 and 3) | R288             | 0.15 ~ 4mV |

### ● TEST POINTS

Idling Current Confirmation



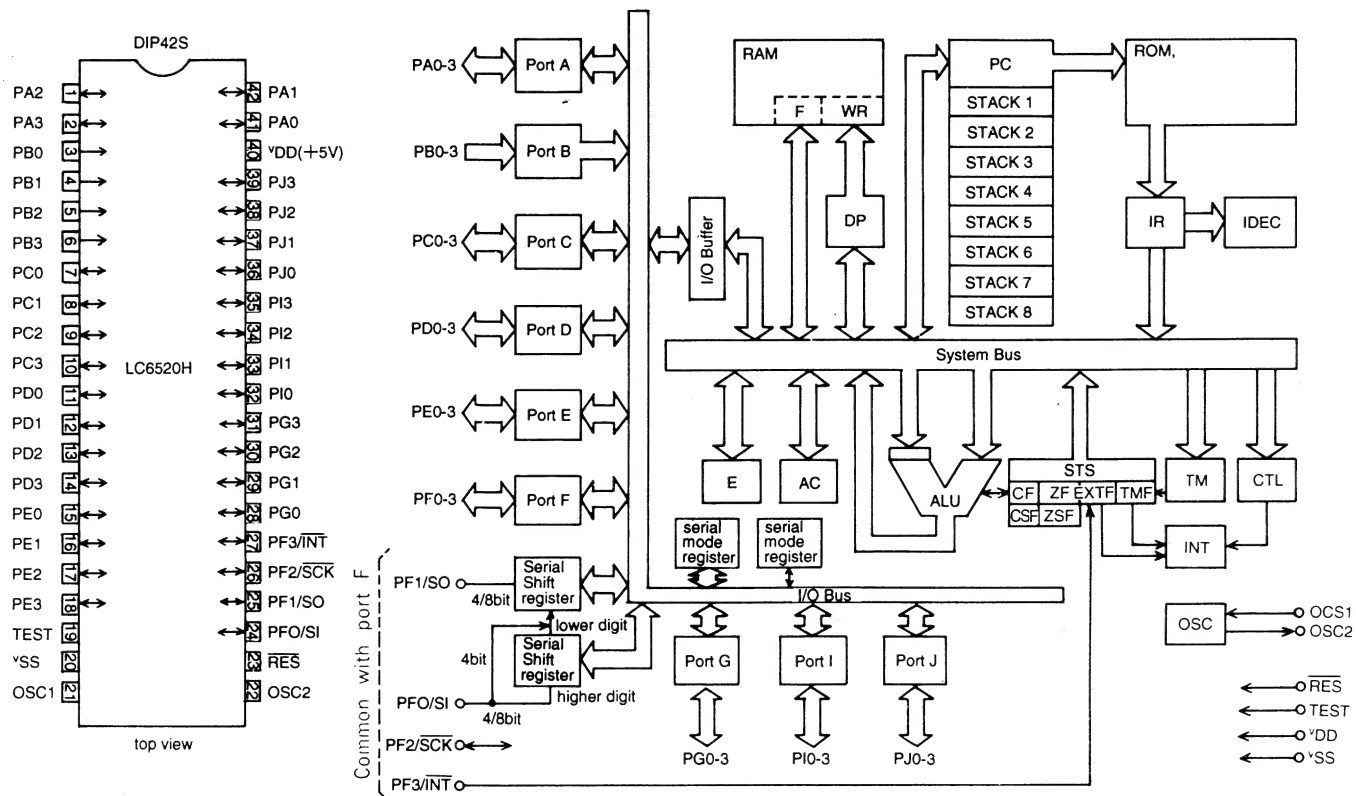
# BLOCK DIAGRAM



# AX-490

## μ-COM DATA (IC306: LC6520H - 4B14)

AX-490



| PIN NO. | PIN NAME | I/O | FUNCTION                    | PIN No. | PORT NAME | I/O | FUNCTION                          |
|---------|----------|-----|-----------------------------|---------|-----------|-----|-----------------------------------|
| 1       | PA2      | -   |                             | 22      | OSC2      |     | Crystal Oscillator (4MHz)         |
| 2       | PA3      | I   | VDD                         | 23      | RES       |     | Reset input                       |
| 3       | PB0      | I   | Selector position data      | 24      | PF0       |     |                                   |
| 4       | PB1      | I   | Selector position data      | 25      | PF1       | I   | GND                               |
| 5       | PB2      | I   | Selector position data      | 26      | PF2       | I   | Remote control power on/off H: on |
| 6       | PB3      | I   | Selector position data      | 27      | PF3       | I   | Remote control data               |
| 7       | PC0      | I   | Selector position data      | 28      | PG0       | I   | Power switch data                 |
| 8       | PC1      | I   | Selector position data      | 29      | PG1       | I   | Power control H: on L: off        |
| 9       | PC2      | I   | Selector position data      | 30      | PG2       | O   | Power output H: on                |
| 10      | PC3      | I   | GND                         | 31      | PG3       | O   | Stand-by H: on                    |
| 11      | PD0      | I   | Selector cam position data  | 32      | PI0       | O   | Volume motor data                 |
| 12      | PD1      | I   | Selector 6 or 7 Select L: 6 | 33      | PI1       | O   | Volume motor data                 |
| 13      | PD2      | I   | Audio mute key data         | 34      | PI2       | O   | Selector motor data               |
| 14      | PD3      | O   | PLAY/CUT(Player control)    | 35      | PI3       | O   | Selector motor data               |
| 15      | PE0      | I   | Power data H: G, model      | 36      | PJ0       | I   |                                   |
| 16      | PE1      | I   | Power down data             | 37      | PJ1       | O   |                                   |
| 17      | PE2      |     |                             | 38      | PJ2       | O   |                                   |
| 18      | PE3      | I   | GND                         | 39      | PJ3       | O   | Muting control H: on              |
| 19      | TEST     |     | GND                         | 40      | VDD       |     | +5V                               |
| 20      | VSS      |     | GND                         | 41      | PA0       |     |                                   |
| 21      | OSC1     |     | Crystall oscillator (4MHz)  | 42      | PA1       |     |                                   |

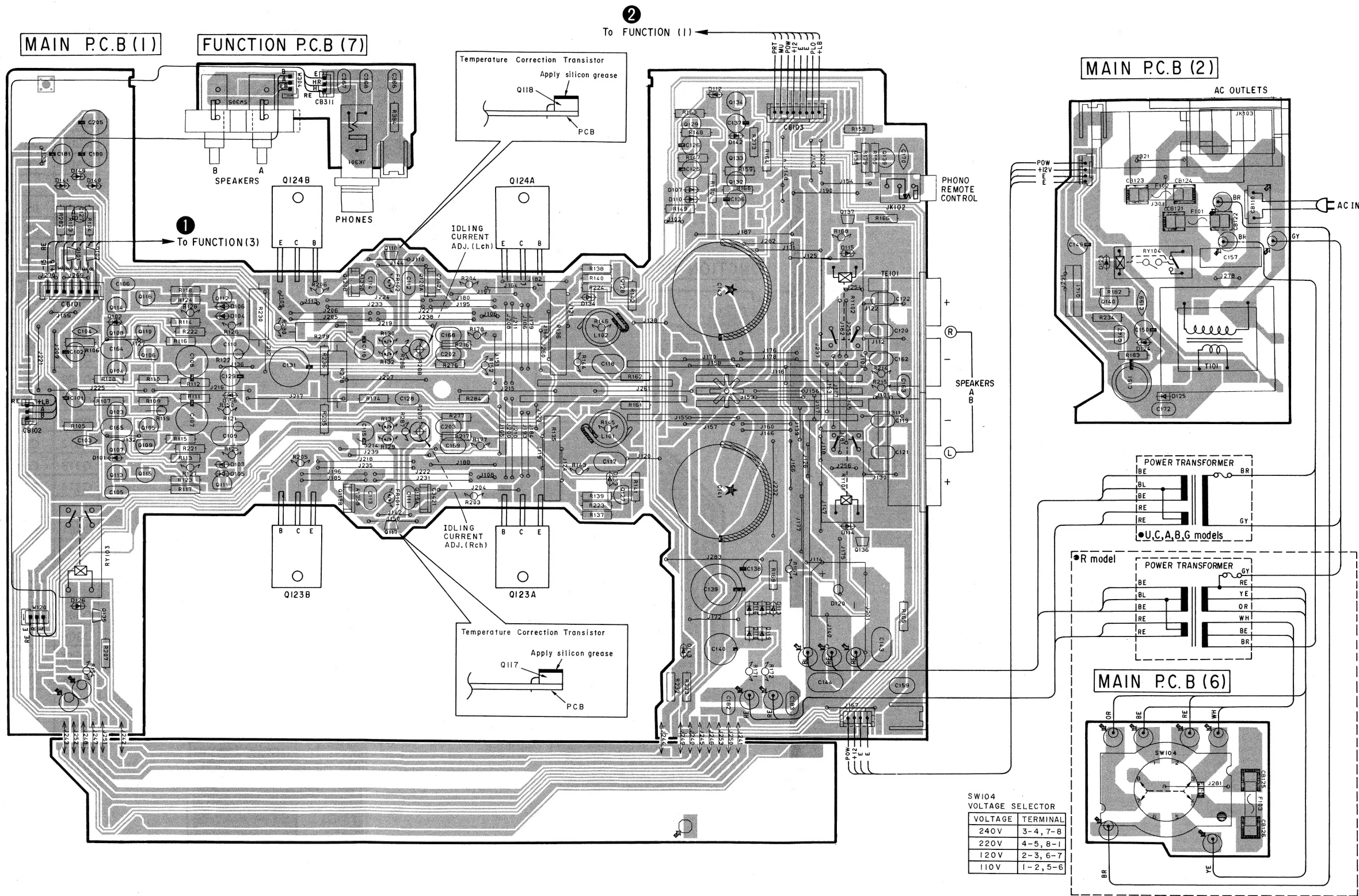
## AX-490



| Ref. No. | Location |
|----------|----------|
| IC301    | A3       |
| IC302    | B5       |
| IC303    | F2       |
| IC304    | D3       |
| IC305    | D3       |
| IC306    | C3       |
|          |          |
| Q301     | B5       |
| Q302     | B5       |
| Q303     | C5       |
| Q304     | C5       |
| Q305     | B3       |
| Q306     | B3       |
| Q307     | B3       |
| Q308     | C3       |
| Q309     | C3       |
| Q310     | C3       |
| Q311     | C3       |
| Q312     | C3       |
| Q313     | C3       |
| Q314     | C3       |
|          |          |
| D301     | F3       |
| D302     | G3       |
| D303     | F2       |
| D304     | F2       |
| D305     | C3       |
| D306     | C3       |
| D307     | D3       |
| D308     | B3       |
| D309     | C3       |
| D310     | B3       |
| D311     | B3       |
| D312     | B3       |
| D313     | C3       |
| D314     | C3       |
| D315     | C3       |
| D316     | C3       |
| D317     | C3       |



PRINTED CIRCUIT BOARD AX-490











Semiconductors Location

| Ref. No. | Location | Ref. No. | Location |
|----------|----------|----------|----------|
| Q101     | A2       | D101     | A3       |
| Q102     | A2       | D102     | A3       |
| Q103     | A3       | D103     | B3       |
| Q104     | A3       | D104     | B3       |
| Q105     | A3       | D105     | B3       |
| Q106     | A3       | D106     | B3       |
| Q107     | A3       | D107     | D2       |
| Q108     | A3       | D110     | D2       |
| Q109     | A3       | D112     | D2       |
| Q110     | A3       | D113     | D4       |
| Q111     | B3       | D114     | E3       |
| Q112     | B2       | D115     | E2       |
| Q113     | A3       | D116     | D4       |
| Q114     | A3       | D117     | D4       |
| Q115     | A3       | D118     | D4       |
| Q116     | A2       | D119     | D4       |
| Q117     | B3       | D120     | D4       |
| Q118     | B2       | D123     | F2       |
| Q119A    | C3       | D124     | F3       |
| Q119B    | B3       | D125     | F3       |
| Q120A    | C2       | D126     | A3       |
| Q120B    | B2       | D133     | C3       |
| Q123A    | C4       | D134     | C2       |
| Q123B    | B4       | D140     | A2       |
| Q124A    | C2       | D141     | A2       |
| Q124B    | B2       | D142     | D2       |
| Q127     | C3       | D143     | D4       |
| Q128     | C2       | D149     | A2       |
| Q129     | D2       | D158     | B3       |
| Q132     | D2       |          |          |
| Q133     | D2       |          |          |
| Q134     | D2       |          |          |
| Q135     | A4       |          |          |
| Q136     | E4       |          |          |
| Q137     | E2       |          |          |
| Q138     | E2       |          |          |
| Q139     | E2       |          |          |
| Q140     | F3       |          |          |
| Q141     | F2       |          |          |
| Q142     | F3       |          |          |



### ■ SCHEMATIC DIAGRAM (Function)

## AX-490

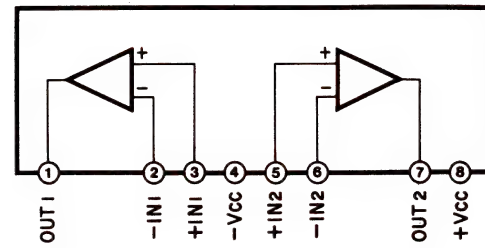
| RESISTOR  |                                 |
|---|---------------------------------|
| REMARKS   | PARTS NAME                      |
| NO MARK   | CARBON FILM RESISTOR (P=5)      |
|    | CARBON FILM RESISTOR (P=10)     |
|   | METAL OXIDE FILM RESISTOR       |
|  | METAL FILM RESISTOR             |
|  | METAL PLATE RESISTOR            |
|  | FIRE PROOF CARBON FILM RESISTOR |
|  | CEMENT MOLDED RESISTOR          |
|  | SEMI VARIABLE RESISTOR          |
|  | CHIP RESISTOR                   |

| CAPACITOR |                                  |   |
|-----------|----------------------------------|---|
| REMARKS   | PARTS NAME                       |   |
| NO MARK   | ELECTROLYTIC CAPACITOR           | N |
| ⊗         | TANTALUM CAPACITOR               |   |
| NO MARK   | CERAMIC CAPACITOR                | H |
| ⊙         | CERAMIC TUBULAR CAPACITOR        |   |
| ⊗         | POLYESTER FILM CAPACITOR         |   |
| ○         | POLYSTYRENE FILM CAPACITOR       |   |
| ①         | MICA CAPACITOR                   |   |
| ⊙         | POLYPROPYLENE FILM CAPACITOR     |   |
| ●         | SEMICONDUCTIVE CERAMIC CAPACITOR |   |

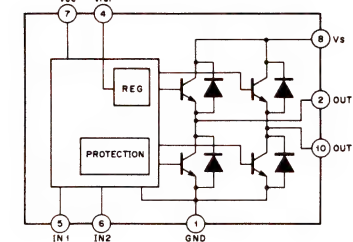
| Mark | Reference Parts Number  | Parts Name |
|------|-------------------------|------------|
| M1   | 303.304.308.309.311.312 | HSS104     |
|      | 314.315                 | 1SS133     |
|      |                         | 1SS176     |

## ■ IC BLOCK

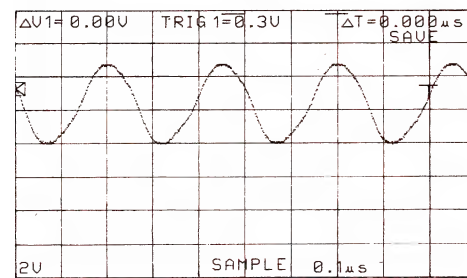
**IC301, 302, 303 : NJM2068LD**  
**(Dual OP-amp)**



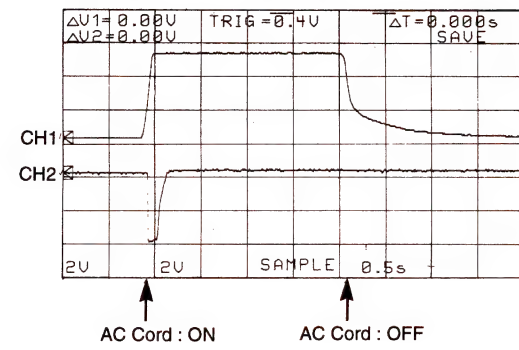
**IC304, 305 : TA7291S**  
**(Motor Driver)**




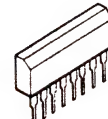
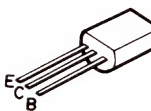


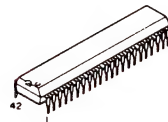
**Point ① (Pin 22 of IC 306)**  
V : 2V/div      H : 0.1μsec/div  
DC range      1 : 1 probe



**Point ②**  
(CH1 : Pin 26 of IC 306)  
(CH2 : Pin 23 of IC 306)  
V : 2V/div      H : 0.5sec/div  
DC range      1 : 1 probe



### PIN CONNECTION DIAGRAM OF TRANSISTORS, DIODES AND ICS.

|  |  |
|--|--|
| <p>2SC3330    DTA144ES<br/>         2SD1915    DTC144ES<br/>         2SA1317    DTC114ES</p>  | <p>NJM2068LD</p>  |
| <p>2SC1890</p>    | <p>TA7291S</p>    |
| <p>All Diodes</p>   | <p>LC6520H</p>    |

- All voltages are measured with a 10M $\Omega$ /V DC electric volt meter.
- Components having special characteristics are marked  $\Delta$  and must be replaced with parts having specifications equal to those originally installed.
- Schematic diagram is subject to change without notice.



■ SCHEMATIC DIAGRAM (Main) AX-490

| CAPACITOR |                                  |
|-----------|----------------------------------|
| REMARKS   | PARTS NAME                       |
| NO MARK   | ELECTROLYTIC CAPACITOR           |
| ⊗         | TANTALUM CAPACITOR               |
| ⊙         | CERAMIC CAPACITOR                |
| ⊖         | CERAMIC TUBULAR CAPACITOR        |
| ⊕         | POLYESTER FILM CAPACITOR         |
| ○         | POLYSTYRENE FILM CAPACITOR       |
| ◇         | MICA CAPACITOR                   |
| ⊙         | POLYPROPYLENE FILM CAPACITOR     |
| ●         | SEMICONDUCTIVE CERAMIC CAPACITOR |

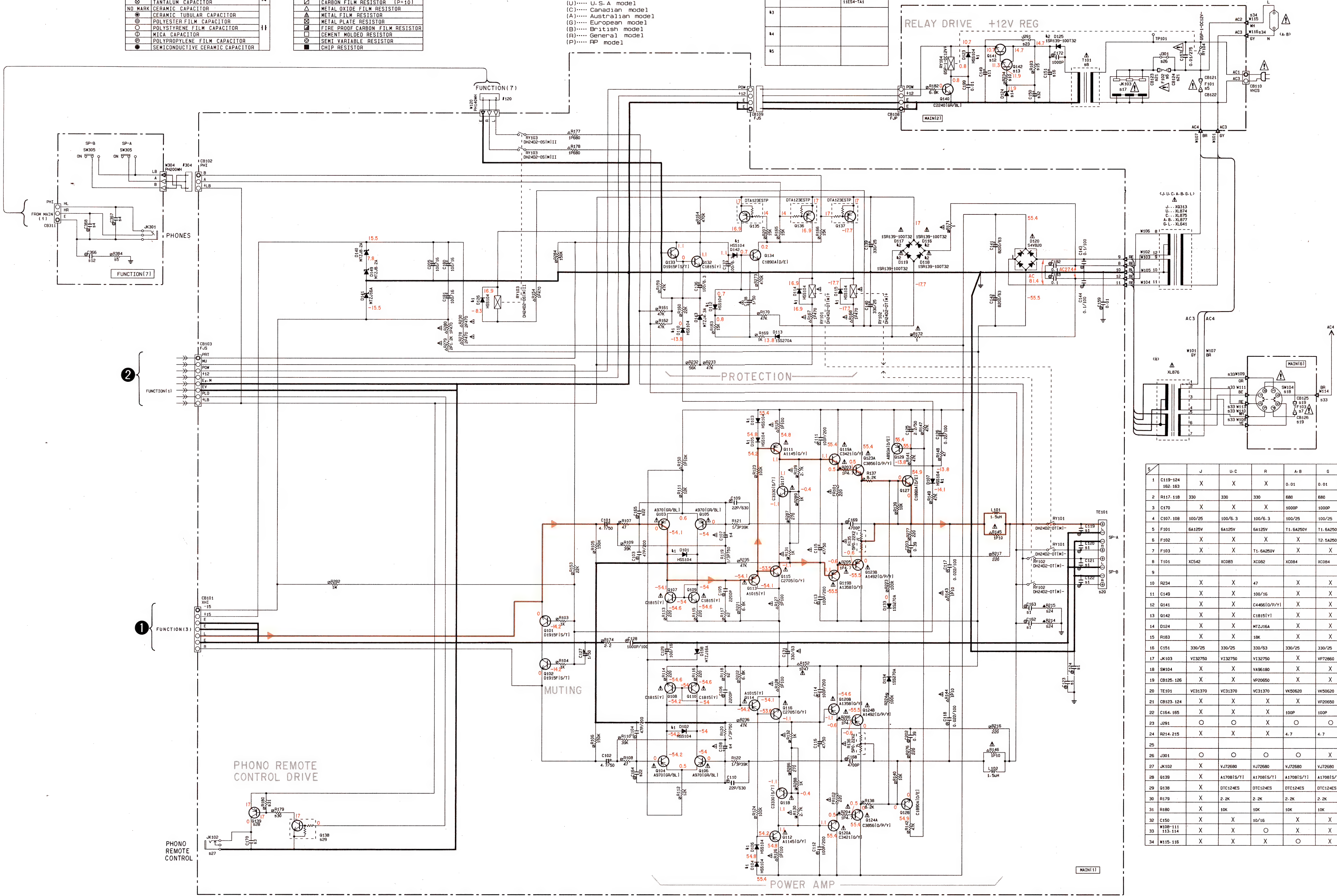
| RESISTOR |                                 |
|----------|---------------------------------|
| REMARKS  | PARTS NAME                      |
| NO MARK  | CARBON FILM RESISTOR (P=5)      |
| ⊠        | CARBON FILM RESISTOR (P=10)     |
| △        | METAL OXIDE FILM RESISTOR       |
| ▲        | METAL FILM RESISTOR             |
| ⊞        | METAL PLATE RESISTOR            |
| ⊞        | FIRE PROOF CARBON FILM RESISTOR |
| ⊞        | CEMENT MOLDED RESISTOR          |
| ⊞        | SEMI VARIABLE RESISTOR          |
| ■        | CHIP RESISTOR                   |

NOTICE

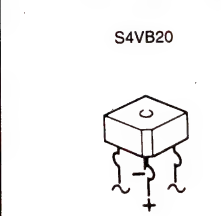
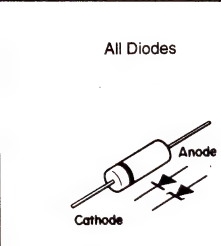
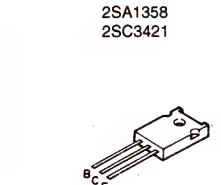
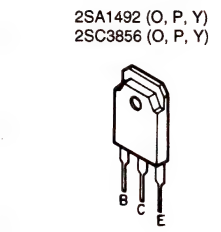
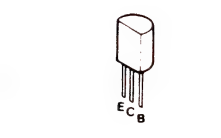
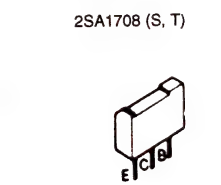
(J)..... Japanese model  
(U)..... U.S.A model  
(C)..... Canadian model  
(A)..... Australian model  
(G)..... European model  
(B)..... British model  
(R)..... General model  
(P)..... PP model

Interchangeable Parts at Manufacture Stage

| Mark | Reference Parts Number                        | Parts Name                 |
|------|---|----------------------------|
| A1   | D101-107, 110, 112, 114<br>115, 123, 126, 142 | HSS104<br>1SS133<br>1SS176 |
| A2   | D116-119, 125                                 | 1SR139-100T32<br>11ES4-TA1 |
| A3   |   |                            |
| A4   |   |                            |
| A5   |   |                            |



PIN CONNECTION DIAGRAM OF TRANSISTORS, DIODES AND ICs.



| S  | J                    | U-C      | R          | A-B          | G          |
|----|----------------------|----------|------------|--------------|------------|
| 1  | C119-124<br>162, 163 | X        | X          | X            | 0.01       |
| 2  | R117, 118<br>330     | 330      | 330        | E80          | E80        |
| 3  | C170                 | X        | X          | 100P         | 100P       |
| 4  | C107, 108<br>100/25  | 100/6, 3 | 100/6, 3   | 100/25       | 100/25     |
| 5  | F101<br>6A125V       | 6A125V   | 6A125V     | T1: 6A250V   | T1: 6A250V |
| 6  | F102                 | X        | X          | X            | T2: 6A250V |
| 7  | F103                 | X        | X          | T1: 6A250V   | X          |
| 8  | T101<br>XC542        | XC083    | XC082      | XC084        | XC084      |
| 9  |                      |          |            |              |            |
| 10 | R234                 | X        | X          | 47           | X          |
| 11 | C149                 | X        | X          | 100/16       | X          |
| 12 | Q141                 | X        | X          | C446610/P/Y1 | X          |
| 13 | Q142                 | X        | X          | C18151Y1     | X          |
| 14 | D124                 | X        | X          | MTZJ15A      | X          |
| 15 | R183                 | X        | X          | 18K          | X          |
| 16 | C151                 | 330/25   | 330/25     | 330/63       | 330/25     |
| 17 | JK103<br>V132750     | V132750  | V132750    | X            | VP72680    |
| 18 | SW104                | X        | X          | VA96180      | X          |
| 19 | CB125-126            | X        | X          | WP20650      | X          |
| 20 | TE101<br>VC31370     | VC31370  | VC31370    | VK50620      | VK50620    |
| 21 | CB123-124            | X        | X          | X            | VP20650    |
| 22 | C164, 165            | X        | X          | X            | 100P       |
| 23 | J291                 | ○        | ○          | X            | ○          |
| 24 | R214, 215            | X        | X          | X            | 4.7        |
| 25 |                      |          |            |              |            |
| 26 | J301                 | ○        | ○          | ○            | X          |
| 27 | JK102                | X        | VJ72680    | VJ72680      | VJ72680    |
| 28 | Q139                 | X        | A17081S/T1 | A17081S/T1   | A17081S/T1 |
| 29 | Q138                 | X        | DTC124ES   | DTC124ES     | DTC124ES   |
| 30 | R179                 | X        | 2.2K       | 2.2K         | 2.2K       |
| 31 | R180                 | X        | 10K        | 10K          | 10K        |
| 32 | C150                 | X        | X          | 10/16        | X          |
| 33 | W108-111<br>113, 114 | X        | X          | ○            | X          |
| 34 | W115-116             | X        | X          | X            | ○          |

• All voltages are measured with a 10MΩ/V DC electric volt meter.  
• Components having special characteristics are marked △ and must be replaced with parts having specifications equal to those originally installed.  
• Schematic diagram is subject to change without notice.



# PARTS LIST

## ■ ELECTRICAL PARTS

### ■ WARNING

Components having special characteristics are marked  $\triangle$  and must be replaced with parts having specifications equal to those originally installed.

- Carbon resistors (1/6W or 1/4W) are not included in the ELECTRICAL PARTS List. For the parts No. of the carbon resistors, refer to last page.

### ABBREVIATIONS IN THIS LIST ARE AS FOLLOWS :

|            |                                |            |                                |
|------------|--------------------------------|------------|--------------------------------|
| C.A.EL.CHP | : CHIP ALUMI. ELECTROLYTIC CAP | L.EMIT     | : LIGHT EMITTING MODULE        |
| C.CE       | : CERAMIC CAP                  | LED.DSPLY  | : LED DISPLAY                  |
| C.CE.ARRAY | : CERAMIC CAP ARRAY            | LED.INFRD  | : LED, INFRARED                |
| C.CE.CHP   | : CHIP CERAMIC CAP             | MODUL.RF   | : MODULATOR, RF                |
| C.CE.ML    | : MULTILAYER CERAMIC CAP       | PHOT.CPL   | : PHOTO COUPLER                |
| C.CE.M.CHP | : CHIP MULTILAYER CERAMIC CAP  | PHOT.INTR  | : PHOTO INTERRUPTER            |
| C.CE.SAFTY | : RECOGNIZED CERAMIC CAP       | PHOT.RFLCT | : PHOTO REFLECTOR              |
| C.CE.TUBLR | : CERAMIC TUBULAR CAP          | PIN.TEST   | : PIN, TEST POINT              |
| C.CE.SMI   | : SEMI CONDUCTIVE CERAMIC CAP  | PLST.RIVET | : PLASTIC RIVET                |
| C.EL       | : ELECTROLYTIC CAP             | R.ARRAY    | : RESISTOR ARRAY               |
| C.MICA     | : MICA CAP                     | R.CAR      | : CARBON RESISTOR              |
| C.ML.FLM   | : MULTILAYER FILM CAP          | R.CAR.CHP  | : CHIP RESISTOR                |
| C.MP       | : METALLIZED PAPER CAP         | R.CAR.FP   | : FLAME PROOF CARBON RESISTOR  |
| C.MYLAR    | : MYLAR FILM CAP               | R.FUS      | : FUSABLE RESISTOR             |
| C.MYLAR.ML | : MULTILAYER MYLAR FILM CAP    | R.MTL.CHP  | : CHIP METAL FILM RESISTOR     |
| C.PAPER    | : PAPER CAPACITOR              | R.MTL.FLM  | : METAL FILM RESISTOR          |
| C.PLS      | : POLYSTYRENE FILM CAP         | R.MTL.OXD  | : METAL OXIDE FILM RESISTOR    |
| C.POL      | : POLYESTER FILM CAP           | R.MTL.PLAT | : METAL PLATE RESISTOR         |
| C.POLY     | : POLYETHYLENE FILM CAP        | RSNR.CE    | : CERAMIC RESONATOR            |
| C.PP       | : POLYPROPYLENE FILM CAP       | RSNR.CRYS  | : CRYSTAL RESONATOR            |
| C.TNTL     | : TANTALUM CAP                 | R.TW.CEM   | : TWIN CEMENT FIXED RESISTOR   |
| C.TNTL.CHP | : CHIP TANTALUM CAP            | R.WW       | : WIRE WOUND RESISTOR          |
| C.TRIM     | : TRIMMER CAP                  | SCR.BND.HD | : BIND HEAD B-TITE SCREW       |
| CN         | : CONNECTOR                    | SCR.BW.HD  | : BW HEAD TAPPING SCREW        |
| CN.BS.PIN  | : CONNECTOR, BASE PIN          | SCR.CUP    | : CUP TITE SCREW               |
| CN.CANNON  | : CONNECTOR, CANNON            | SCR.TERM   | : SCREW TERMINAL               |
| CN.DIN     | : CONNECTOR, DIN               | SCR.TR     | : SCREW, TRANSISTOR            |
| CN.FLAT    | : CONNECTOR, FLAT CABLE        | SUPRT.PCB  | : SUPPORT, P.C.B.              |
| CN.POST    | : CONNECTOR, BASE POST         | SURG.PRTCT | : SURGE PROTECTOR              |
| COIL.MX.AM | : COIL, AM MIX                 | SW.TACT    | : TACT SWITCH                  |
| COIL.AT.FM | : COIL, FM ANTENNA             | SW.LEAF    | : LEAF SWITCH                  |
| COIL.DT.FM | : COIL, FM DETECT              | SW.LEVER   | : LEVER SWITCH                 |
| COIL.MX.FM | : COIL, FM MIX                 | SW.MICRO   | : MICRO SWITCH                 |
| COIL.OUTPT | : OUTPUT COIL                  | SW.PUSH    | : PUSH SWITCH                  |
| DIOD.ARRAY | : DIODE ARRAY                  | SW.RT.ENC  | : ROTARY ENCODER               |
| DIODE.BRG  | : DIODE BRIDGE                 | SW.RT.MTR  | : ROTARY SWITCH WITH MOTOR     |
| DIODE.CHP  | : CHIP DIODE                   | SW.RT      | : ROTARY SWITCH                |
| DIODE.VAR  | : VARACTOR DIODE               | SW.SLIDE   | : SLIDE SWITCH                 |
| DIOD.Z.CHP | : CHIP ZENER DIODE             | TERM.SP    | : SPEAKER TERMINAL             |
| DIODE.ZENR | : ZENER DIODE                  | TERM.WRAP  | : WRAPPING TERMINAL            |
| DSCR.CE    | : CERAMIC DISCRIMINATOR        | THRMST.CHP | : CHIP THERMISTOR              |
| FER.BEAD   | : FERRITE BEADS                | TR.CHP     | : CHIP TRANSISTOR              |
| FER.CORE   | : FERRITE CORE                 | TR.DGT     | : DIGITAL TRANSISTOR           |
| FET.CHP    | : CHIP FET                     | TR.DGT.CHP | : CHIP DIGITAL TRANSISTOR      |
| FL.DSPLY   | : FLUORESCENT DISPLAY          | TRANS      | : TRANSFORMER                  |
| FLTR.CE    | : CERAMIC FILTER               | TRANS.PULS | : PULSE TRANSFORMER            |
| FLTR.COMB  | : COMB FILTER MODULE           | TRANS.PWR  | : POWER TRANSFORMER ASS'y      |
| FLTR.LC.RF | : LC FILTER ,EMI               | TUNER.AM   | : TUNER PACK, AM               |
| GND.MTL    | : GROUND PLATE                 | TUNER.FM   | : TUNER PACK, FM               |
| GND.TERM   | : GROUND TERMINAL              | TUNER.PK   | : FRONT-END TUNER PACK         |
| HOLDER.FUS | : FUSE HOLDER                  | VR         | : ROTARY POTENTIOMETER         |
| IC.PRTCT   | : IC PROTECTOR                 | VR.MTR     | : POTENTIOMETER WITH MOTOR     |
| JUMPER.CN  | : JUMPER CONNECTOR             | VR.SW      | : POTENTIOMETER WITH ROTARY SW |
| JUMPER.TST | : JUMPER, TEST POINT           | VR.SLIDE   | : SLIDE POTENTIOMETER          |
| L.DTCT     | : LIGHT DETECTING MODULE       | VR.TRIM    | : TRIMMER POTENTIOMETER        |

**Note)** Those parts marked with "#" are not included in the P.C.B. ass'y.

## MAIN P.C.B.

| Schm | Ref. | PART NO. | Description                       |
|------|------|----------|-----------------------------------|
|      | *    | VS976900 | P. C. B. MAIN(UC)                 |
|      | *    | VS977000 | P. C. B. MAIN(R)                  |
|      | *    | VS977100 | P. C. B. MAIN(AB)                 |
|      | *    | VS977200 | P. C. B. MAIN(G)                  |
|      |      | CB101    | VL845100 CN. BS. PIN 7P           |
|      |      | CB102    | VD004600 CN. BS. PIN 3P           |
|      | *    | CB108    | VS839400 CN. BS. PIN 4P           |
|      |      | CB109    | VS839500 CN 4P                    |
|      |      | CB110    | VG879900 CN. BS. PIN 2P           |
|      |      | CB121    | VP206500 HOLDER. FUS EYF-52BC     |
|      |      | CB122    | VP206500 HOLDER. FUS EYF-52BC     |
|      |      | CB123    | VP206500 HOLDER. FUS EYF-52BC(G)  |
|      |      | CB124    | VP206500 HOLDER. FUS EYF-52BC(G)  |
|      |      | CB125    | VP206500 HOLDER. FUS EYF-52BC(R)  |
|      |      | CB126    | VP206500 HOLDER. FUS EYF-52BC(R)  |
|      |      | C101     | VT646900 C. EL 4.7uF 25V          |
|      |      | C102     | VT646900 C. EL 4.7uF 25V          |
|      |      | C103     | VK533800 C. PP 47pF 200V          |
|      |      | C104     | VK533800 C. PP 47pF 200V          |
|      |      | C105     | VK512600 C. MYLAR 2200pF 50V      |
|      |      | C106     | VK512600 C. MYLAR 2200pF 50V      |
|      | △ *  | C107     | VQ568900 C. EL 100uF 6.3V(UCR)    |
|      | △ *  | C107     | VQ569900 C. EL 100uF 25V(ABG)     |
|      | △ *  | C108     | VQ568900 C. EL 100uF 6.3V(UCR)    |
|      | △ *  | C108     | VQ569900 C. EL 100uF 25V(ABG)     |
|      |      | C109     | FU351220 C. MICA 22pF 500V(UCR)   |
|      |      | C109     | FU451150 C. MICA 15pF 500V(ABG)   |
|      |      | C110     | FU351220 C. MICA 22pF 500V(UCR)   |
|      |      | C110     | FU451150 C. MICA 15pF 500V(ABG)   |
|      |      | C111     | VK533900 C. PP 100pF 200V         |
|      |      | C112     | VK533900 C. PP 100pF 200V         |
|      |      | C113     | VK533900 C. PP 100pF 200V         |
|      |      | C114     | VK533900 C. PP 100pF 200V         |
|      | △    | C115     | VG291200 C. EL 47uF 50V           |
|      |      | C116     | VG291200 C. EL 47uF 50V           |
|      |      | C117     | VK534200 C. PP 0.022uF 100V       |
|      |      | C118     | VK534200 C. PP 0.022uF 100V       |
|      |      | C119     | Vi716700 C. MYLAR 0.01uF 50V(ABG) |
|      |      | C120     | Vi716700 C. MYLAR 0.01uF 50V(ABG) |
|      |      | C121     | Vi716700 C. MYLAR 0.01uF 50V(ABG) |
|      |      | C122     | Vi716700 C. MYLAR 0.01uF 50V(ABG) |
|      |      | C123     | VK534100 C. PP 0.01uF 100V(ABG)   |
|      |      | C124     | VK534100 C. PP 0.01uF 100V(ABG)   |
|      |      | C125     | VG290600 C. EL 2.2uF 50V          |
|      |      | C126     | UJ895220 C. EL 0.22uF 100V        |
|      |      | C127     | VN283200 C. EL 1uF 50V            |
|      |      | C128     | VK534000 C. PP 220pF 200V(ABG)    |
|      |      | C128     | VL872800 C. PP 1000pF 100V(UCR)   |
|      |      | C129     | VG288900 C. EL 100uF 25V          |
|      |      | C131     | VK699400 C. EL 330uF 63V          |
|      |      | C136     | VF760000 C. EL 100uF 10V          |
|      | △    | C137     | VF760000 C. EL 100uF 10V          |
|      | △    | C138     | VG290500 C. EL 1uF 50V            |

| Schm | Ref. | PART NO. | Description                          |
|------|------|----------|--------------------------------------|
|      |      | C139     | VG289100 C. EL 330uF 25V             |
|      |      | C140     | VG289100 C. EL 330uF 25V             |
|      |      | C141     | VK574400 C. EL 8200uF 63V            |
|      |      | C142     | VK574400 C. EL 8200uF 63V            |
|      | *    | C143     | VR325400 C. MYLAR 0.1uF 100V         |
|      | *    | C144     | VR325400 C. MYLAR 0.1uF 100V         |
|      |      | C149     | VG288900 C. EL 100uF 25V(R)          |
|      |      | C150     | VG290900 C. EL 10uF 50V(R)           |
|      |      | C151     | VG289100 C. EL 330uF 25V(UCABG)      |
|      |      | C151     | VK699400 C. EL 330uF 63V(R)          |
|      | △ *  | C157     | VS741700 C. CE. SAFTY 0.01uF 275V    |
|      |      | C159     | VE324800 C. MYLAR. ML 0.01uF 50V     |
|      |      | C162     | Vi716700 C. MYLAR 0.01uF 50V(ABG)    |
|      |      | C163     | Vi716700 C. MYLAR 0.01uF 50V(ABG)    |
|      |      | C164     | VK533900 C. PP 100pF 200V(ABG)       |
|      |      | C165     | VK533900 C. PP 100pF 200V(ABG)       |
|      |      | C168     | VE326000 C. MYLAR. ML 0.1uF 50V      |
|      |      | C169     | VE326000 C. MYLAR. ML 0.1uF 50V      |
|      |      | C170     | FG213100 C. CE 1000pF 50V(ABG)       |
|      | *    | C172     | UA253100 C. MYLAR 1000pF 50V         |
|      |      | C180     | VF964800 C. EL 100uF 16V             |
|      |      | C181     | VF964800 C. EL 100uF 16V             |
|      |      | C182     | VK399200 C. MYLAR. ML 0.39uF 50V     |
|      |      | C183     | VK399200 C. MYLAR. ML 0.39uF 50V     |
|      |      | C199     | FG214100 C. CE 0.01uF 50V            |
|      |      | C202     | VE326000 C. MYLAR. ML 0.1uF 50V      |
|      |      | C203     | VE326000 C. MYLAR. ML 0.1uF 50V      |
|      |      | C205     | VF964800 C. EL 100uF 16V             |
|      |      | D101     | VD631600 DIODE 1SS133,176,HSS104     |
|      |      | D102     | VD631600 DIODE 1SS133,176,HSS104     |
|      |      | D103     | VD631600 DIODE 1SS133,176,HSS104     |
|      |      | D104     | VD631600 DIODE 1SS133,176,HSS104     |
|      |      | D105     | VD631600 DIODE 1SS133,176,HSS104     |
|      |      | D106     | VD631600 DIODE 1SS133,176,HSS104     |
|      |      | D107     | VD631600 DIODE 1SS133,176,HSS104     |
|      |      | D110     | VD631600 DIODE 1SS133,176,HSS104     |
|      |      | D112     | VD631600 DIODE 1SS133,176,HSS104     |
|      |      | D113     | VN008700 DIODE 1SS270A               |
|      |      | D114     | VD631600 DIODE 1SS133,176,HSS104     |
|      |      | D115     | VD631600 DIODE 1SS133,176,HSS104     |
|      | △    | D116     | VH770800 DIODE 1SR139-100            |
|      | △    | D117     | VH770800 DIODE 1SR139-100            |
|      | △    | D118     | VH770800 DIODE 1SR139-100            |
|      | △    | D119     | VH770800 DIODE 1SR139-100            |
|      | △    | D120     | iH001090 DIODE. BRG S4VB20 2.6A 200V |
|      |      | D123     | VD631600 DIODE 1SS133,176,HSS104     |
|      |      | D124     | VG440300 DIODE. ZENR MTZJ12C 12V(R)  |
|      |      | D125     | VH770800 DIODE 1SR139-100            |
|      |      | D126     | VD631600 DIODE 1SS133,176,HSS104     |
|      |      | D133     | VN008700 DIODE 1SS270A               |
|      |      | D134     | VN008700 DIODE 1SS270A               |
|      |      | D140     | VG438800 DIODE. ZENR MTZJ8.2A 8.2V   |
|      |      | D141     | VG441000 DIODE. ZENR MTZJ16A 16V     |

\* New Parts

## MAIN P.C.B.

| Schm | Ref.  | PART NO. | Description              |
|------|-------|----------|--------------------------|
|      | D142  | VD631600 | DIODE 1SS133,176,HSS104  |
|      | D143  | VG436700 | DIODE.ZENR MTZJ4.3A 4.3V |
|      | D149  | VG438800 | DIODE.ZENR MTZJ8.2A 8.2V |
|      | D158  | VG441000 | DIODE.ZENR MTZJ16A 16V   |
| △    | F101  | KB001660 | FUSE T1.60A 250V(ABG)    |
| △ *  | F101  | VS823100 | FUSE 6.0A 125V(UCR)      |
| △    | F102  | KB002980 | FUSE T2.5A 250V(G)       |
| △    | F103  | KB001660 | FUSE T1.60A 250V(R)      |
| △    | FR101 | VK188200 | R.FUS 220Ω 1/4W          |
| △    | FR102 | VK188200 | R.FUS 220Ω 1/4W          |
|      | JK102 | VJ726800 | JACK.MNI (G)             |
| △    | JK103 | Vi327500 | OUTLET.AC 3P(UCR)        |
| △    | JK103 | VP728600 | OUTLET.AC 3P(G)          |
| *    | L101  | VP575600 | COIL 1.5uH               |
| *    | L102  | VP575600 | COIL 1.5uH               |
|      | Q101  | VK432900 | TR 2SD1915F S,T          |
| △    | Q102  | VK432900 | TR 2SD1915F S,T          |
|      | Q103  | iA097000 | TR 2SA970 GR,BL          |
| △    | Q104  | iA097000 | TR 2SA970 GR,BL          |
| △    | Q105  | iA097000 | TR 2SA970 GR,BL          |
| △    | Q106  | iA097000 | TR 2SA970 GR,BL          |
| △    | Q107  | iC1815C0 | TR 2SC1815 Y             |
| △    | Q108  | iC1815C0 | TR 2SC1815 Y             |
| △    | Q109  | iC1815C0 | TR 2SC1815 Y             |
| △    | Q110  | iC1815C0 | TR 2SC1815 Y             |
| △    | Q111  | VE198700 | TR 2SA1145 O,Y           |
| △    | Q112  | VE198700 | TR 2SA1145 O,Y           |
| △    | Q113  | iA101521 | TR 2SA1015 Y             |
| △    | Q114  | iA101521 | TR 2SA1015 Y             |
| △    | Q115  | VE198800 | TR 2SC2705 O,Y           |
| △    | Q116  | VE198800 | TR 2SC2705 O,Y           |
| △    | Q117  | VC218900 | TR 2SC3330 R,S,T         |
| △    | Q118  | VC218900 | TR 2SC3330 R,S,T         |
| △    | Q119B | iX603580 | TR 2SA1358               |
| △    | Q119A | iX603590 | TR 2SC3421               |
| △    | Q120B | iX603580 | TR 2SA1358               |
| △    | Q120A | iX603580 | TR 2SC3421               |
| △ #  | Q123B | iX606460 | TR 2SA1492 O,P,Y         |
| △ #  | Q123A | iX606470 | TR 2SC3856 O,P,Y         |
| △ #  | Q124B | iX606460 | TR 2SA1492 O,P,Y         |
| △ #  | Q124A | iX606470 | TR 2SC3856 O,P,Y         |
| *    | Q127  | VP883100 | TR 2SC1890A D,E          |
| *    | Q128  | VP883100 | TR 2SC1890A D,E          |
| *    | Q129  | VP883000 | TR 2SA893A D,E           |
|      | Q132  | iC1815C0 | TR 2SC1815 Y             |
|      | Q133  | VK432900 | TR 2SD1915F S,T          |
| *    | Q134  | VP883100 | TR 2SC1890A D,E          |
|      | Q135  | VF325300 | TR,DGT DTA123ESTP        |
|      | Q136  | VF325300 | TR,DGT DTA123ESTP        |
|      | Q137  | VF325300 | TR,DGT DTA123ESTP        |
|      | Q138  | VF331200 | TR,DGT DTC124ES(G)       |
| *    | Q139  | VP872600 | TR 2SA1708 S,T(G)        |
|      | Q140  | iC224030 | TR 2SC2240 GR,BL         |

| Schm | Ref.  | PART NO. | Description               |
|------|-------|----------|---------------------------|
|      | Q141  | VP768300 | TR 2SC4466 O,P,Y(R)       |
|      | Q142  | iC1815C0 | TR 2SC1815 Y(R)           |
| △    | R125  | HL315100 | R.MTL.OXD 100Ω 1W         |
| △    | R126  | HL315100 | R.MTL.OXD 100Ω 1W         |
| △    | R127  | HL315100 | R.MTL.OXD 100Ω 1W         |
| △    | R128  | HL315100 | R.MTL.OXD 100Ω 1W         |
| △    | R129  | HV456270 | R.CAR.FP 2.7KΩ 1/4W       |
| △    | R130  | HV456270 | R.CAR.FP 2.7KΩ 1/4W       |
| △    | R131  | HV456100 | R.CAR.FP 1KΩ 1/4W         |
| △    | R132  | HV456100 | R.CAR.FP 1KΩ 1/4W         |
| △ *  | R135  | HZ003780 | R.MTL.PLAT 0.22Ω+0.22 5W  |
| △ *  | R136  | HZ003780 | R.MTL.PLAT 0.22Ω+0.22 5W  |
| △    | R143  | HL314100 | R.MTL.OXD 10Ω 1W          |
| △    | R144  | HL314100 | R.MTL.OXD 10Ω 1W          |
| △    | R145  | HL314100 | R.MTL.OXD 10Ω 1W          |
| △    | R146  | HL314100 | R.MTL.OXD 10Ω 1W          |
|      | R150  | VP941800 | R.MTL.OXD 10KΩ 1W         |
| △    | R152  | HL314470 | R.MTL.OXD 47Ω 1W          |
|      | R154  | HL315470 | R.MTL.OXD 470Ω 1W         |
| △    | R167  | HL315470 | R.MTL.OXD 470Ω 1W         |
| △    | R168  | HL315470 | R.MTL.OXD 470Ω 1W         |
|      | R171  | HV453100 | R.CAR.FP 1Ω 1/4W          |
| △    | R172  | HV453100 | R.CAR.FP 1Ω 1/4W          |
|      | R177  | HL315680 | R.MTL.OXD 680Ω 1W         |
|      | R178  | HL315680 | R.MTL.OXD 680Ω 1W         |
| △    | R203  | VP939700 | R.MTL.FLM 4.7Ω 1W         |
|      | R204  | VP939700 | R.MTL.FLM 4.7Ω 1W         |
| △    | R205  | VP939700 | R.MTL.FLM 4.7Ω 1W         |
|      | R206  | VP939700 | R.MTL.FLM 4.7Ω 1W         |
|      | R214  | VP939700 | R.MTL.FLM 4.7Ω 1W(ABG)    |
|      | R215  | VP939700 | R.MTL.FLM 4.7Ω 1W(ABG)    |
| △    | R230  | HL325470 | R.MTL.OXD 470Ω 2W         |
| △    | R278  | HL325470 | R.MTL.OXD 470Ω 2W         |
| △    | R279  | HL326120 | R.MTL.OXD 1.2KΩ 2W        |
| △    | R280  | HL315470 | R.MTL.OXD 470Ω 1W         |
|      | R286  | HV455270 | R.CAR.FP 270Ω 1/4W        |
|      | R287  | HV455270 | R.CAR.FP 270Ω 1/4W        |
|      | R288  | HV456100 | R.CAR.FP 1KΩ 1/4W         |
|      | R289  | HV456100 | R.CAR.FP 1KΩ 1/4W         |
| △    | RY101 | VK438300 | RELAY DH24D2-OTM- II      |
| △    | RY102 | VK438300 | RELAY DH24D2-OTM- II      |
|      | RY103 | VT561500 | RELAY DC JW2ASN-DC24V     |
|      | RY104 | VH230800 | RELAY G5P-1-DC12V         |
| △    | SW104 | VA961800 | VOLT.SELCT ESE-37247-F(R) |
| △    | T101  | XC082A00 | TRANS.PWR (R)             |
| △    | T101  | XC083A00 | TRANS.PWR (UC)            |
| △    | T101  | XC084A00 | TRANS.PWR (ABG)           |
|      | TE101 | VC313700 | TERM.SP 8P(UCR)           |
|      | TE101 | VK506200 | TERM.SP 8P(ABG)           |
|      |       | VJ828000 | PIN IMSA-6024-03E         |
|      |       | BB071360 | SCR.TERM 8.3x13           |
|      |       | BB070700 | GND.MTL                   |

\* New Parts

## FUNCTION P.C.B.

| Schm | Ref. | PART NO. | Description                     |
|------|------|----------|---------------------------------|
|      | *    | VS976600 | P. C. B. FUNCTION(JUCRA)        |
|      | *    | VS976700 | P. C. B. FUNCTION(BG)           |
|      | *    | CB301    | VQ961400 CN. BS. PIN 11P        |
|      | *    | CB302    | VQ963200 CN. BS. PIN 11P        |
|      |      | CB303    | VK026500 CN. BS. PIN 6P         |
|      |      | CB304    | Vi878400 CN. BS. PIN 6P         |
|      |      | CB305    | Vi878500 CN. BS. PIN 7P         |
|      |      | CB306    | VK025100 CN. BS. PIN 7P         |
|      | *    | CB307    | VQ960800 CN. BS. PIN 5P         |
|      | *    | CB308    | VQ962600 CN. BS. PIN 5P         |
|      |      | CB309    | VB858200 CN. BS. PIN 3P         |
|      | *    | CB310    | VR362000 CN. BS. PIN 13P        |
|      |      | CB311    | VD004600 CN. BS. PIN 3P         |
|      | *    | CB312    | VR358400 CN. BS. PIN 13P        |
|      |      | CB313    | VD004900 CN. BS. PIN 6P         |
|      |      | C303     | VQ462600 C. MYLAR 220pF 50V     |
|      |      | C304     | VQ462600 C. MYLAR 220pF 50V     |
|      |      | C305     | VG286900 C. EL 220uF 10V        |
|      |      | C306     | VG286900 C. EL 220uF 10V        |
|      |      | C307     | UA254330 C. MYLAR 0.033uF 50V   |
|      |      | C308     | UA254330 C. MYLAR 0.033uF 50V   |
|      |      | C309     | UA653910 C. MYLAR 9100pF 50V    |
|      |      | C310     | UA653910 C. MYLAR 9100pF 50V    |
|      |      | C311     | VG290900 C. EL 10uF 50V         |
|      |      | C312     | VG290900 C. EL 10uF 50V         |
|      |      | C313     | UA653470 C. MYLAR 4700pF 50V    |
|      |      | C314     | UA653470 C. MYLAR 4700pF 50V    |
|      |      | C315     | VG288900 C. EL 100uF 25V        |
|      |      | C316     | VG288900 C. EL 100uF 25V        |
|      |      | C317     | UA652100 C. MYLAR 100pF 50V     |
|      |      | C318     | UA652100 C. MYLAR 100pF 50V     |
|      |      | C319     | VG278400 C. CE. TUBLR 220pF 50V |
|      |      | C320     | VG278400 C. CE. TUBLR 220pF 50V |
|      |      | C321     | UA652100 C. MYLAR 100pF 50V     |
|      |      | C322     | UA652100 C. MYLAR 100pF 50V     |
|      |      | C323     | VG278400 C. CE. TUBLR 220pF 50V |
|      |      | C324     | VG278400 C. CE. TUBLR 220pF 50V |
|      |      | C325     | VK984200 C. MYLAR 220pF 50V     |
|      |      | C326     | VK984200 C. MYLAR 220pF 50V     |
|      |      | C327     | VT646900 C. EL 4.7uF 25V        |
|      |      | C328     | VT646900 C. EL 4.7uF 25V        |
|      |      | C329     | VT646800 C. EL 10uF 16V         |
|      |      | C330     | VT646800 C. EL 10uF 16V         |
|      |      | C331     | Vi715900 C. MYLAR 2200pF 50V    |
|      |      | C332     | Vi715900 C. MYLAR 2200pF 50V    |
|      |      | C333     | VG287800 C. EL 330uF 16V        |
|      |      | C334     | VG287800 C. EL 330uF 16V        |
|      |      | C335     | VG287800 C. EL 330uF 16V        |
|      |      | C336     | VG287800 C. EL 330uF 16V        |
|      |      | C337     | VK533800 C. PP 47pF 200V        |
|      |      | C338     | VK533800 C. PP 47pF 200V        |
|      |      | C339     | VG290300 C. EL 0.47uF 50V       |
|      |      | C340     | VG290300 C. EL 0.47uF 50V       |

| Schm | Ref. | PART NO. | Description                          |
|------|------|----------|--------------------------------------|
|      |      | C341     | VE021900 C. EL 4.7uF 100V            |
|      |      | C342     | VE021900 C. EL 4.7uF 100V            |
|      |      | C343     | VF466700 C. CE. TUBLR 47pF 50V       |
|      |      | C344     | VF466700 C. CE. TUBLR 47pF 50V       |
|      |      | C345     | VQ082700 C. EL 10uF 16V              |
|      |      | C346     | VQ082700 C. EL 10uF 16V              |
|      |      | C347     | Vi715900 C. MYLAR 2200pF 50V         |
|      |      | C348     | Vi715900 C. MYLAR 2200pF 50V         |
|      | *    | C349     | UA655120 C. MYLAR 0.12uF 50V         |
|      | *    | C350     | UA655120 C. MYLAR 0.12uF 50V         |
|      | *    | C351     | UA655120 C. MYLAR 0.12uF 50V         |
|      | *    | C352     | UA655120 C. MYLAR 0.12uF 50V         |
|      |      | C353     | UA254330 C. MYLAR 0.033uF 50V        |
|      |      | C354     | UA254330 C. MYLAR 0.033uF 50V        |
|      | *    | C355     | VS214100 C. MYLAR 0.068uF 50V        |
|      | *    | C356     | VS214100 C. MYLAR 0.068uF 50V        |
|      |      | C357     | VG279000 C. CE. TUBLR 820pF 50V      |
|      |      | C358     | VG279000 C. CE. TUBLR 820pF 50V      |
|      |      | C359     | VQ462600 C. MYLAR 220pF 50V          |
|      |      | C360     | VQ462600 C. MYLAR 220pF 50V          |
|      |      | C361     | VG278400 C. CE. TUBLR 220pF 50V      |
|      |      | C362     | VG278400 C. CE. TUBLR 220pF 50V      |
|      |      | C363     | VE326000 C. MYLAR. ML 0.1uF 50V      |
|      |      | C364     | VE326000 C. MYLAR. ML 0.1uF 50V      |
|      |      | C365     | Vi716700 C. MYLAR 0.01uF 50V(BG)     |
|      |      | C366     | Vi716700 C. MYLAR 0.01uF 50V(BG)     |
|      |      | C367     | VE324800 C. MYLAR. ML 0.01uF 50V(BG) |
|      |      | C368     | VE324800 C. MYLAR. ML 0.01uF 50V(BG) |
|      |      | C369     | VF760000 C. EL 100uF 10V             |
|      |      | C370     | VF760000 C. EL 100uF 10V             |
|      |      | C371     | VG290900 C. EL 10uF 50V              |
|      |      | C372     | VG291200 C. EL 47uF 50V              |
|      |      | C373     | VH053100 C. CE. TUBLR 0.1uF 50V      |
|      |      | C374     | VF992600 C. EL 4700uF 5.5V           |
|      |      | C375     | VG290900 C. EL 10uF 50V              |
|      |      | C376     | VG290900 C. EL 10uF 50V              |
|      |      | C377     | VH053100 C. CE. TUBLR 0.1uF 50V      |
|      |      | C378     | VG290500 C. EL 1uF 50V               |
|      |      | C379     | VG291200 C. EL 47uF 50V              |
|      |      | C380     | VH053100 C. CE. TUBLR 0.1uF 50V      |
|      |      | C381     | VG289100 C. EL 330uF 25V             |
|      |      | D301     | VP593800 LED(or) SLR-305DCA47        |
|      |      | D302     | VP593800 LED(or) SLR-305DCA47        |
|      |      | D303     | VD631600 DIODE 1SS133,176,HSS104     |
|      |      | D304     | VD631600 DIODE 1SS133,176,HSS104     |
|      |      | D305     | VG435800 DIODE. ZENR MTZJ3.0A 3.0V   |
|      |      | D306     | VG436700 DIODE. ZENR MTZJ4.3A 4.3V   |
|      |      | D307     | VP594000 LED(re) SLR-305VCA47        |
|      |      | D308     | VD631600 DIODE 1SS133,176,HSS104     |
|      |      | D309     | VD631600 DIODE 1SS133,176,HSS104     |
|      |      | D310     | VG437800 DIODE. ZENR MTZJ5.6C 5.6V   |
|      |      | D311     | VD631600 DIODE 1SS133,176,HSS104     |
|      |      | D312     | VD631600 DIODE 1SS133,176,HSS104     |

\* New Parts

## FUNCTION P.C.B.

| Schm | Ref.  | PART NO. | Description                 |
|------|-------|----------|-----------------------------|
|      | D313  | VG437800 | DIODE. ZENR MTZJ5.6C 5.6V   |
|      | D314  | VD631600 | DIODE 1SS133,176,HSS104     |
|      | D315  | VD631600 | DIODE 1SS133,176,HSS104     |
|      | D316  | VD631600 | DIODE 1SS133,176,(BG)       |
|      | D317  | VD631600 | DIODE 1SS133,176,(BG)       |
|      | IC301 | XM356A00 | IC NJM2068LD                |
|      | IC302 | XM356A00 | IC NJM2068LD                |
|      | IC303 | XM356A00 | IC NJM2068LD                |
|      | IC304 | XF557A00 | IC TA7291S                  |
|      | IC305 | XF557A00 | IC TA7291S                  |
|      | IC306 | XM088B00 | IC LC6520H-4B14             |
| *    | JK301 | VS899700 | JACK. PHONE JY-6317-02-030  |
|      | L301  | VB056900 | COIL 220uH (BG)             |
|      | L302  | VB056900 | COIL 220uH (BG)             |
| *    | PJ301 | VR765100 | JACK. PIN 2P                |
| *    | PJ302 | VR765100 | JACK. PIN 2P                |
|      | PJ303 | VJ794600 | JACK. PIN 6P                |
|      | PJ304 | VJ794600 | JACK. PIN 6P                |
|      | Q301  | VK432900 | TR 2SD1915F S,T             |
|      | Q302  | VK432900 | TR 2SD1915F S,T             |
|      | Q303  | VG721700 | TR. DGT DTA144ES            |
|      | Q304  | VD678700 | TR. DGT DTC114ES            |
|      | Q305  | VC218900 | TR 2SC3330 R,S,T            |
| *    | Q306  | VP883100 | TR 2SC1890A D,E             |
|      | Q307  | VG721700 | TR. DGT DTA144ES            |
|      | Q308  | VG721700 | TR. DGT DTA144ES            |
|      | Q309  | VC218900 | TR 2SC3330 R,S,T            |
|      | Q310  | VD678700 | TR. DGT DTC114ES            |
|      | Q311  | VD678700 | TR. DGT DTC114ES            |
|      | Q312  | VC218700 | TR 2SA1317 R,S,T            |
|      | Q313  | VG722000 | TR. DGT DTC144ES            |
| *    | Q314  | VP883100 | TR 2SC1890A D,E             |
|      | R319  | HL315470 | R. MTL. OXD 470 $\Omega$ 1W |
|      | R320  | HL315470 | R. MTL. OXD 470 $\Omega$ 1W |
|      | R353  | HL315100 | R. MTL. OXD 100 $\Omega$ 1W |
|      | R354  | HL315100 | R. MTL. OXD 100 $\Omega$ 1W |
|      | R361  | HL315470 | R. MTL. OXD 470 $\Omega$ 1W |
|      | R362  | HL315470 | R. MTL. OXD 470 $\Omega$ 1W |
|      | R397  | HV454100 | R. CAR. FP 10 $\Omega$ 1/4W |
|      | SW301 | VT146000 | SW. RT SRBAA46              |
| *    | SW302 | VT021100 | SW. RT RS003-A046BHN20F13   |
| *    | SW303 | VP870800 | SW. PUSH SPUL12             |
| *    | SW304 | VP870800 | SW. PUSH SPUL12             |
|      | SW305 | VJ850200 | SW. PUSH PSE021A2KP 2       |
|      | SW306 | VG392900 | SW. TACT SKHVAA             |
|      | TE301 | LA002110 | TERM. WRAP 2P               |
| *    | U301  | VR860700 | L. DTCT SPS-422-1           |
|      | VR301 | VR710500 | VR. MTR A100K $\Omega$      |
| *    | VR302 | VP741800 | VR B20K $\Omega$            |
| *    | VR303 | VP741900 | VR G25K $\Omega$            |
| *    | VR304 | VP700700 | VR A100K $\Omega$           |
| *    | VR305 | VP742000 | VR MN50K $\Omega$           |
|      | XL301 | VB759100 | RSNR. CE 4MHz               |

\* New Parts

| Schm | Ref. | PART NO. | Description       |
|------|------|----------|-------------------|
|      |      | VJ828000 | PIN IMSA-6024-03E |
|      |      | BB071360 | SCR. TERM 8.3x13  |
|      |      | BB069510 | GND. MTL No. 6951 |

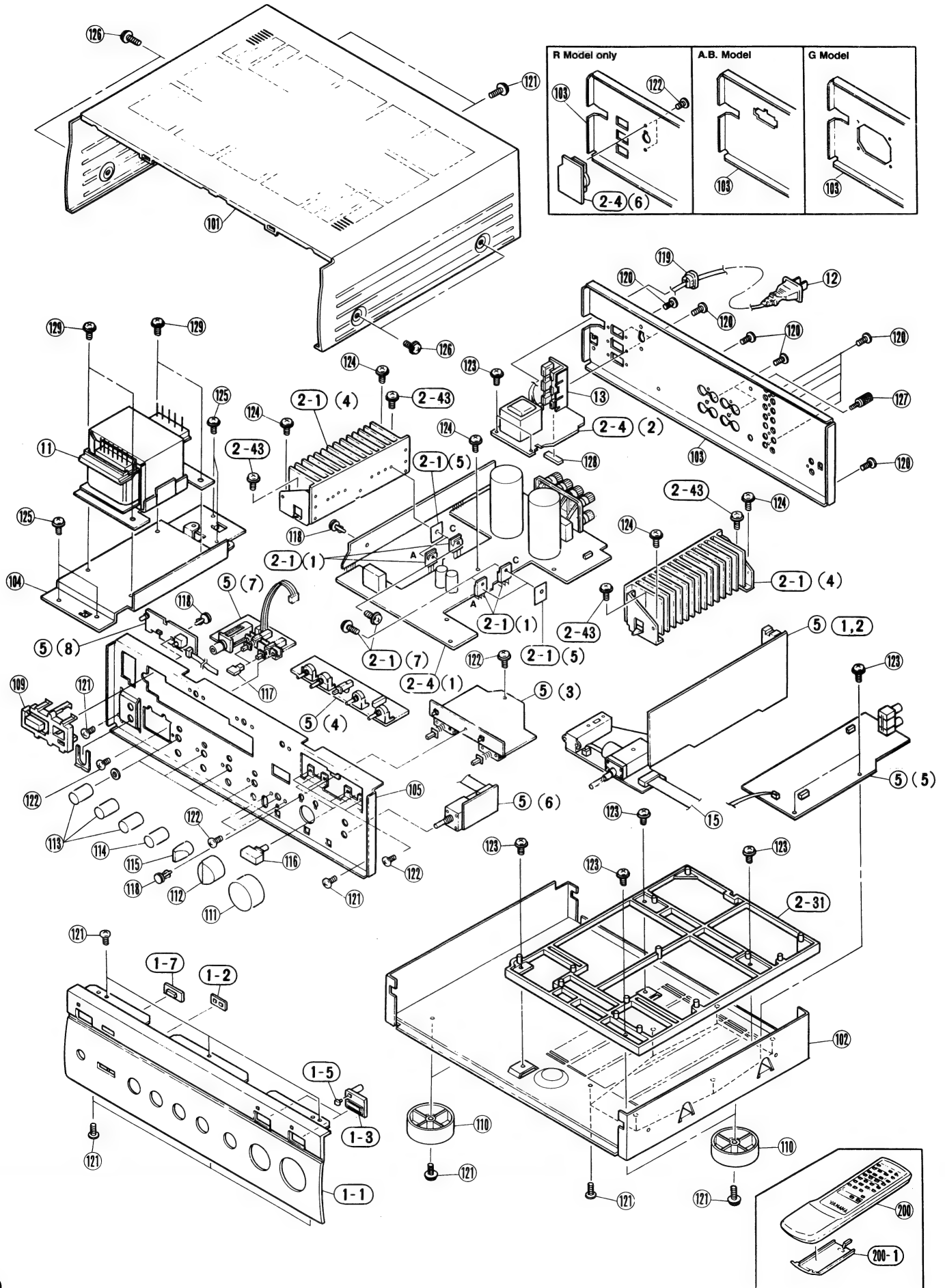
A

B

C

D

# EXPLODED VIEW AX-490



# **MECHANICAL PARTS** Note) ø : Diameter

**AX-490**

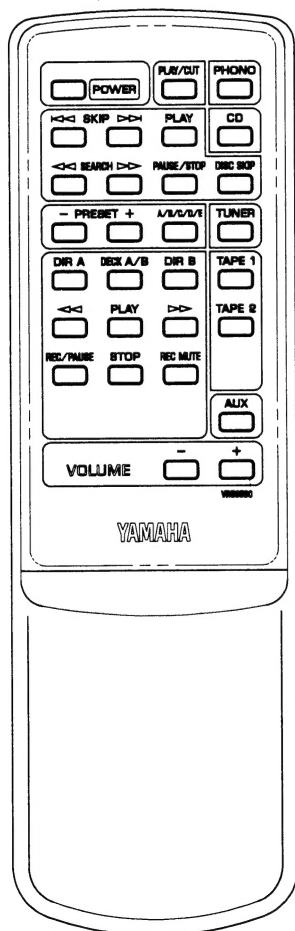
| Ref.<br>No. | PART NO. | Description           | Remarks       | Markets     |
|-------------|----------|-----------------------|---------------|-------------|
| * 1- 1      | VS587600 | FRONT PANEL           | BL            |             |
| * 1- 1      | VS587700 | FRONT PANEL           | TI            |             |
| * 1- 2      | VQ793400 | BUTTON GUIDE          | BL            |             |
| * 1- 2      | VQ793500 | BUTTON GUIDE          | TI            |             |
| 1- 3        | VH816700 | BUTTON GUIDE          | 10x25         |             |
| 1- 3        | VH816800 | BUTTON GUIDE          | 10x25         |             |
| 1- 5        | VH897700 | LENS                  | 2.2Lx2.2      |             |
| 1- 7        | VH897500 | LENS                  |               |             |
| 2-1-1       | iX606460 | TRANSISTOR            | 2SA1492 O,P,Y | Q123B,Q124B |
| 2-1-1       | iX606470 | TRANSISTOR            | 2SC3856 O,P,Y | Q123A,Q124A |
| * 2-1-4     | VP493100 | HEAT SINK ASS'Y       |               |             |
| 2-1-5       | VK195900 | SHEET                 | 19x24         |             |
| 2-1-7       | VK173200 | SCREW, TRANSISTOR     | 3x15 SP FCM3  |             |
| * 2-4       | VS976900 | P.C.B. ASS'Y          | MAIN          | (UC)        |
| * 2-4       | VS977000 | P.C.B. ASS'Y          | MAIN          | (R)         |
| * 2-4       | VS977100 | P.C.B. ASS'Y          | MAIN          | (AB)        |
| * 2-4       | VS977200 | P.C.B. ASS'Y          | MAIN          | (G)         |
| * 2-31      | VS586500 | CHASSIS               |               |             |
| 2-43        | VB770200 | BW HEAD P-TITE SCREW  | 3x10-8 FCM3   |             |
| * 5         | VS976600 | P.C.B. ASS'Y          | FUNCTION      | (UCRAB)     |
| * 5         | VS976700 | P.C.B. ASS'Y          | FUNCTION      | (G)         |
| △ * 11      | XL641A00 | POWER TRANSFORMER     |               | (G)         |
| △ * 11      | XL874A00 | POWER TRANSFORMER     |               | (U)         |
| △ * 11      | XL875A00 | POWER TRANSFORMER     |               | (C)         |
| △ * 11      | XL876A00 | POWER TRANSFORMER     |               | (R)         |
| △ * 11      | XL877A00 | POWER TRANSFORMER     |               | (AB)        |
| △ * 12      | VQ508500 | POWER CORD ASS'Y      |               | (R)         |
| △ * 12      | VQ508600 | POWER CORD ASS'Y      |               | (A)         |
| △ * 12      | VS168300 | POWER CORD ASS'Y      |               | (UC)        |
| △ * 12      | VS168400 | POWER CORD ASS'Y      |               | (G)         |
| △ 12        | VS680700 | POWER CORD ASS'Y      |               | (B)         |
| 13          | VJ775000 | AC OUTLET             | 2P            | (B)         |
| 13          | VP418700 | AC OUTLET             | 2P            | (A)         |
| 15          | VT016100 | CONNECTOR, FLAT CABLE | 13P 180mm     |             |
| * 101       | VS001200 | TOP COVER             | BL            |             |
| * 101       | VS001300 | TOP COVER             | TI            |             |
| * 102       | VS001400 | CHASSIS               |               |             |
| * 103       | VS587800 | REAR PANEL            |               | (U)         |
| * 103       | VS588000 | REAR PANEL            |               | (C)         |
| * 103       | VS588100 | REAR PANEL            |               | (R)         |
| * 103       | VS588200 | REAR PANEL            |               | (AB)        |
| * 103       | VS588300 | REAR PANEL            |               | (G)         |
| * 104       | VS586600 | FRAME, PCB            |               |             |
| * 105       | VS586400 | SUB CHASSIS           |               |             |
| * 109       | VS363200 | BUTTON, POWER         | BL            |             |
| * 109       | VS363300 | BUTTON, POWER         | TI            |             |
| 110         | VQ780300 | LEG                   | D60xH16       |             |
| 111         | VQ945600 | KNOB                  | D42           | TI          |
| 111         | VR021500 | KNOB                  | D42           | BL          |
| 112         | VK220100 | KNOB                  | D32           | BL          |
| 112         | VK220200 | KNOB                  | D32           | TI          |
| * 113       | VS409600 | KNOB                  | D18           | BL          |
| * 113       | VS409800 | KNOB                  | D18           | TI          |
| * 114       | VS587400 | KNOB D18L             | D18           | BL          |
| * 114       | VS587500 | KNOB D18L             | D18           | TI          |

\* New Parts

| Ref.<br>No. | PART NO. | Description                  | Remarks         | Markets         |
|-------------|----------|------------------------------|-----------------|-----------------|
| * 115       | VS587200 | KNOB D18/SEL                 | D18             | BL              |
| * 115       | VS587300 | KNOB D18/SEL                 | D18             | TI              |
| 116         | VQ780000 | BUTTON                       |                 | BL              |
| 116         | VQ780100 | BUTTON                       |                 | TI              |
| 117         | VQ779000 | BUTTON                       | 3x14            | BL              |
| 117         | VQ779100 | BUTTON                       | 3x14            | TI              |
| * 118       | VQ368600 | PUSH RIVET                   | P3555-B         |                 |
| 119         | VN158600 | CORD STOPPER                 | No. 2104        |                 |
| 120         | EN301010 | BIND HEAD BONDING TAP. SCREW | 3x8 FCRM3-BL    |                 |
| 121         | Ei330086 | BIND HEAD B-TITE SCREW       | 3x8 FCRM3-BL    |                 |
| 122         | ED330066 | BIND HEAD SCREW              | 3x6 FCRM3-BL    |                 |
| 123         | EX602240 | BW HEAD B-TITE SCREW         | 3x10 FCRM3-BL   |                 |
| 124         | EL300480 | BW HEAD B-TITE SCREW         | 3x15-8 FCRM3-BL |                 |
| 125         | EK365020 | BW HEAD SCREW                | 4x6 FCRM3-BL    |                 |
| 126         | EL300470 | BW HEAD S-TITE SCREW         | 4x8-10 FCRM3-BL | BL              |
| 126         | EX601150 | BW HEAD S-TITE SCREW         | 4x8-10 FNM3-BL  | TI              |
| 127         | AA627310 | GROUND TERMINAL              |                 |                 |
| 128         | VT386900 | SPACER, PCB                  | T17             | (AB)            |
| 129         | EL300470 | BW HEAD S-TITE SCREW         | 4x8-10 FCRM3-BL |                 |
| ACCESSORIES |          |                              |                 |                 |
| * 200       | VR505900 | REMOTE CONTROL TRANSMITTER   |                 |                 |
| 200-1       | CX675300 | LID                          | 70x31BLSMK      | 103RRS-028-01MR |
|             |          | BATTERY, MANGANESE           | SUM-3,AA,R06    |                 |



### ■ SCHEMATIC DIAGRAM

[illegible]

| Key No. | Function        | HEX    |      |
|---------|-----------------|--------|------|
|         |                 | CUSTOM | DATA |
| 1       | INPUT PHONO     | 7A     | 14   |
| 2       | PHONO PLAY/CUT  | 7A     | 0E   |
| 4       | POWER           | 7A     | 1F   |
| 5       | INPUT CD        | 7A     | 15   |
| 6       | CD PLAY         | 7A     | 08   |
| 7       | CD SKIP ►►      | 7A     | 0A   |
| 8       | CD SKIP ◄◄      | 7A     | 0B   |
| 9       | CD DISC SKIP    | 7A     | 4F   |
| 10      | CD PAUSE/STOP   | 7A     | 09   |
| 11      | CD SEARCH ►►    | 7A     | 0C   |
| 12      | CD SEARCH ◄◄    | 7A     | 0D   |
| 13      | INPUT TUNER     | 7A     | 16   |
| 14      | TUNER A/B/C/D/E | 7A     | 12   |
| 15      | TUNER PRESET +  | 7A     | 10   |
| 16      | TUNER PRESET -  | 7A     | 11   |
| 17      | INPUT TAPE 1    | 7A     | 18   |
| 18      | TAPE DIR B      | 7A     | 40   |
| 19      | TAPE DECK A/B   | 7A     | 06   |
| 20      | TAPE DIR A      | 7A     | 07   |
| 21      | INPUT TAPE 2    | 7A     | 19   |
| 22      | TAPE ►►         | 7A     | 02   |
| 23      | TAPE PLAY       | 7A     | 00   |
| 24      | TAPE ◄◄         | 7A     | 01   |
| 26      | TAPE REC MUTE   | 7A     | 05   |
| 27      | TAPE STOP       | 7A     | 03   |
| 28      | TAPE REC/PAUSE  | 7A     | 04   |
| 29      | INPUT AUX       | 7A     | 17   |
| 33      | VOLUME +        | 7A     | 1A   |
| 34      | VOLUME -        | 7A     | 1B   |

# Parts List for Carbon Resistors

| Value          | 1/4W Type Part No. | 1/6W Type Part No. | Value          | 1/4W Type Part No. | 1/6W Type Part No. |
|----------------|--------------------|--------------------|----------------|--------------------|--------------------|
| 1.0 $\Omega$   | HJ35 3100          | HF85 3100          | 10 k $\Omega$  | HF45 7100          | HF45 7100          |
| 1.8 $\Omega$   | HJ35 3180          | *                  | 11 k $\Omega$  | HF45 7110          | HF45 7110          |
| 2.2 $\Omega$   | HJ35 3220          | HF85 3220          | 12 k $\Omega$  | HJ35 7120          | HF85 7120          |
| 3.3 $\Omega$   | HJ35 3330          | HF85 3330          | 13 k $\Omega$  | HF45 7130          | HF45 7130          |
| 4.7 $\Omega$   | HJ35 3470          | HF85 3470          | 15 k $\Omega$  | HF45 7150          | HF45 7150          |
| 5.6 $\Omega$   | HJ35 3560          | HF85 3560          | 18 k $\Omega$  | HF45 7180          | HF45 7180          |
| 10 $\Omega$    | HF45 4100          | HF45 4100          | 22 k $\Omega$  | HF45 7220          | HF45 7220          |
| 15 $\Omega$    | HJ35 4150          | HF85 4150          | 24 k $\Omega$  | HF45 7240          | HF45 7240          |
| 22 $\Omega$    | HF45 4220          | HF45 4220          | 27 k $\Omega$  | HJ35 7270          | HF85 7270          |
| 27 $\Omega$    | HJ35 4270          | HF85 4270          | 30 k $\Omega$  | HF45 7300          | HF45 7300          |
| 33 $\Omega$    | HF45 4330          | HF45 4330          | 33 k $\Omega$  | HF45 7330          | HF45 7330          |
| 39 $\Omega$    | HJ35 4470          | HF85 4390          | 36 k $\Omega$  | HF45 7360          | HF45 7360          |
| 47 $\Omega$    | HF45 4470          | HF45 4470          | 39 k $\Omega$  | HF45 7390          | HF45 7390          |
| 56 $\Omega$    | HF45 4560          | HF45 4560          | 47 k $\Omega$  | HF45 7470          | HF45 7470          |
| 68 $\Omega$    | HF45 4680          | HF45 4680          | 51 k $\Omega$  | HF45 7510          | HF45 7510          |
| 75 $\Omega$    | HF45 4750          | HF45 4750          | 56 k $\Omega$  | HF45 7560          | HF45 7560          |
| 82 $\Omega$    | HF45 4820          | HF45 4820          | 62 k $\Omega$  | HF45 7620          | HF45 7620          |
| 91 $\Omega$    | HF45 4910          | HF45 4910          | 68 k $\Omega$  | HF45 7680          | HF45 7680          |
| 100 $\Omega$   | HF45 5100          | HF45 5100          | 82 k $\Omega$  | HF45 7820          | HF45 7820          |
| 110 $\Omega$   | HJ35 5110          | HF85 5110          | 91 k $\Omega$  | HF45 7910          | HF45 7910          |
| 120 $\Omega$   | HF45 5120          | HF45 5120          | 100 k $\Omega$ | HF45 8100          | HF45 8100          |
| 150 $\Omega$   | HF45 5150          | HF45 5150          | 110 k $\Omega$ | HF45 8110          | HF45 8110          |
| 160 $\Omega$   | HJ35 5160          | *                  | 120 k $\Omega$ | HF45 8120          | HF45 8120          |
| 180 $\Omega$   | HF45 5180          | HF45 5180          | 150 k $\Omega$ | HF45 8150          | HF45 8150          |
| 200 $\Omega$   | HF45 5200          | HF45 5200          | 180 k $\Omega$ | HF45 8180          | HF45 8180          |
| 220 $\Omega$   | HF45 5220          | HF45 5220          | 220 k $\Omega$ | HJ35 8220          | HF85 8220          |
| 270 $\Omega$   | HF45 5270          | HF45 5270          | 270 k $\Omega$ | HF45 8270          | HF45 8270          |
| 330 $\Omega$   | HF45 5330          | HF45 5330          | 300 k $\Omega$ | HF45 8300          | HF45 8300          |
| 390 $\Omega$   | HF45 5390          | HF45 5390          | 330 k $\Omega$ | HF45 8330          | HF45 8330          |
| 430 $\Omega$   | HF45 5430          | HF45 5430          | 390 k $\Omega$ | HJ35 8390          | HF85 8390          |
| 470 $\Omega$   | HF45 5470          | HF45 5470          | 470 k $\Omega$ | HF45 8470          | HF45 8470          |
| 510 $\Omega$   | HF45 5510          | HF45 5510          | 560 k $\Omega$ | HJ35 8560          | HF85 8560          |
| 560 $\Omega$   | HF45 5560          | HF45 5560          | 680 k $\Omega$ | HJ35 8680          | HF85 8680          |
| 680 $\Omega$   | HF45 5680          | HF45 5680          | 820 k $\Omega$ | HJ35 8820          | HF85 8820          |
| 820 $\Omega$   | HF45 5820          | HF45 5820          | 1.0 M $\Omega$ | HF45 9100          | HF45 9100          |
| 910 $\Omega$   | HF45 5910          | HF45 5910          | 1.2 M $\Omega$ | HJ35 9120          | *                  |
| 1.0 k $\Omega$ | HF45 6100          | HF45 6100          | 1.5 M $\Omega$ | HJ35 9150          | HF85 9150          |
| 1.2 k $\Omega$ | HF45 6120          | HF45 6120          | 1.8 M $\Omega$ | HJ35 9180          | HF85 9180          |
| 1.5 k $\Omega$ | HF45 6150          | HF45 6150          | 2.2 M $\Omega$ | HJ35 9220          | HF85 9220          |
| 1.8 k $\Omega$ | HF45 6180          | HF45 6180          | 3.3 M $\Omega$ | HJ35 9330          | HF85 9330          |
| 2.0 k $\Omega$ | HJ35 6200          | HF85 6200          | 3.9 M $\Omega$ | HJ35 9390          | *                  |
| 2.2 k $\Omega$ | HF45 6220          | HF45 6220          | 4.7 M $\Omega$ | HJ35 9470          | HF85 9470          |
| 2.4 k $\Omega$ | HJ35 6240          | HF85 6240          |                |                    |                    |
| 2.7 k $\Omega$ | HF45 6270          | HF45 6270          |                |                    |                    |
| 3.0 k $\Omega$ | HF45 6300          | HF45 6300          |                |                    |                    |
| 3.3 k $\Omega$ | HF45 6330          | HF45 6330          |                |                    |                    |
| 3.6 k $\Omega$ | HJ35 6360          | HF85 6360          |                |                    |                    |
| 3.9 k $\Omega$ | HF45 6390          | HF45 6390          |                |                    |                    |
| 4.7 k $\Omega$ | HF45 6470          | HF45 6470          |                |                    |                    |
| 5.1 k $\Omega$ | HF45 6510          | HF45 6510          |                |                    |                    |
| 5.6 k $\Omega$ | HF45 6560          | HF45 6560          |                |                    |                    |
| 6.8 k $\Omega$ | HF45 6680          | HF45 6680          |                |                    |                    |
| 8.2 k $\Omega$ | HF45 6820          | HF45 6820          |                |                    |                    |
| 9.1 k $\Omega$ | HF45 6910          | HF45 6910          |                |                    |                    |

**1/4W Type**

**1/6W Type**